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U.S. Credit Markets Interconnectedness and the Effects of the COVID-19 Economic Shock

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Abbreviations

ABCP	Asset-backed commercial paper
ABS	Asset-backed security
B/D	Broker-dealer
CD	Certificate of deposit
CLO	Collateralized loan obligation
CMBS	Commercial mortgage-backed security
CP	Commercial paper
CRE	Commercial real estate
CRT	Credit risk transfer
ETF	Exchange-traded fund
FHLB	Federal Home Loan Banks
GFC	Global Financial Crisis
GSE	Government-sponsored enterprise (i.e., Fannie Mae and Freddie Mac)
HF	Hedge funds
HY	High-yield (i.e., not investment grade)
IG	Investment grade
LOC	Line of credit
MBS	Mortgage-backed security
MMF	Money market mutual fund
mREIT	Mortgage REIT
PL	Private-label (primarily in the context of RMBS and CMBS)
QM	Qualified mortgage
RE	Real estate
REIT	Real estate investment trust
RIC	Registered investment company
RMBS	Residential mortgage-backed security
STFM	Short-term funding market
VIX	Chicago Board Options Exchange volatility index
VRDO	Variable-rate demand obligation



Executive Summary

Purpose

This staff report focuses on the interconnections among the various U.S. credit markets, including how the actions of issuers, intermediaries, and holders of credit in one market can affect other markets and the financial system more generally. The analysis seeks to identify the extent to which these interconnections contributed to or mitigated risk, including systemic risk, during the recent period of market stress during and following the COVID-19 global economic shock of March 2020.

The financial system is complex, with layers of interconnections, participants, and risk transmission nodes among debt, equity, and derivatives markets. The report focuses on interconnectedness within credit markets. The analysis first takes a market segments approach to develop an understanding of the relative size and key characteristics of the principal market segments, and follows with an analysis of the interconnections among the segments within the larger financial system.

The report aims to assist policy makers and other market participants in their efforts to understand and improve market function and enhance the strength and resilience of the financial system. In this regard, the report benefits from, and is intended to complement, ongoing academic and regulatory work on interconnectedness and the dynamics of market stress.

Introduction

The U.S. financial system is a large mosaic of interconnected and interdependent markets, market participants, and institutions. The system benefits from varying degrees of prudential and market, as well as efficiency and fairness-oriented, regulatory oversight, covering both banking and nonbanking entities. The U.S. financial system is a critical driver of domestic and international economic growth and financial security. Naturally, its smooth functioning and resilience to adverse shocks are essential for broader economic stability. The report centers on credit markets, and builds from a segment-by-segment analysis of the life cycle of credit from origination to ownership to secondary market trading, including identification of the various financial intermediaries that facilitate primary and secondary credit flows. At its core, the report then aims to analyze interconnections among these flows of credit under ordinary and stressed conditions.

In March 2020, the U.S. and the worldwide economies experienced the COVID-19 economic shock. The analysis of the credit markets centers on COVID-19 as a case study to illustrate the interconnections and related interdependencies in the U.S. credit markets. The report also makes general observations regarding the feedback from these markets to the general economy and vice-versa.

The report identifies approximately \$54 trillion of credit issued and outstanding in the U.S. financial system at the end of 2019 and broadly traces the flow of approximately \$52 trillion of that credit through various intermediaries and prior holders to the ultimate holders of the credit at that time.

This exercise demonstrates that the financial system and the flow of credit are not monolithic, but are an interconnected collection of markets, each serving different aspects of the general economy. The report identifies and examines in detail six of these markets covering \$44 trillion of outstanding credit: (i) short-term funding market (STFM), (ii) corporate bond market, (iii) leveraged loans and CLO market, (iv) municipal securities market, (v) residential mortgage market and other consumer lending markets, and (vi) commercial mortgage market.

The summary below describes each of the six markets and highlights key COVID-19–induced stresses observed in the market during the current economic shock, as well as how those stresses affected, could have affected, and may affect other markets and the general economy. The remainder of the report discusses each market and those interconnections and potential interconnections, as well as related effects, in more detail. Of course, the magnitude of the COVID-19 economic shock and the entirely unexpected nature of the shock have, and might continue to have, an adverse effect on the economy and financial markets and this report should be viewed in that context.

Information-Oriented, No Policy Recommendations

The report should not be viewed as making or endorsing any particular policy recommendation. Rather, the report is intended to inform and assist in the framing of policy discussions by providing an evidentiary understanding (based on staff analysis, extant research, and industry outreach calls) of the U.S. credit-based financial system and certain of the observed market stresses in the system.

Key COVID-19–Induced Stresses in the Financial System

Using the COVID-19 economic shock in March 2020 as a case study, the report describes certain of the stresses that developed within the U.S. financial system focusing on structural- and operations-driven points of stress as the market participants’ preferences shifted dramatically.

The COVID-19–induced stress on the financial markets falls into three categories:

1. **Short-term funding stresses** caused by suddenly elevated demand for liquidity in the STFM. This appears to be a result of a combination of how market participants organized their businesses and how these participants reacted in the face of increased risk aversion, funding costs, margin requirements, haircuts, and other disruptions (e.g., actions of certain funds).
2. **Market structure/liquidity driven stresses** caused by elevated demand for intermediation in the context of constrained capital and risk limits. The stresses were most apparent in markets that are principally dealer-intermediated, including markets for municipal securities, corporate bonds, and short-term funding. While many of these markets saw increased notional trading volume, trading costs were exceptionally elevated and volumes did not keep up with the surge in demand.

3. **Long-term credit stresses** emanating generally from the immediate and anticipated impacts of the COVID-19 economic shock, which may still be unfolding, especially in the corporate bond, municipal securities, commercial real estate (CRE) and leveraged loan markets. While the timing and extent of any future effects are uncertain, the long-term impact of COVID-19 on the issuers and purchasers of long-term credit—i.e., corporations, households, local and federal government, pension funds, insurance companies, and other investors—is ultimately expected to manifest itself in long-term issuer- and sector-specific credit issues. Initially, these stresses were not as acute as the short-term funding and liquidity stresses and may have been ameliorated or otherwise addressed by monetary and fiscal policy.

1. Short-Term Funding Stresses

The STFM experienced significant stress in March 2020 almost immediately following the inception of the COVID-19 economic shock. The approximately \$10 trillion STFM comprises several sub-markets, which finance the short-dated funding needs of investors in the capital markets, nonfinancial corporations, and financial institutions. These markets include, *inter alia*, repo financing, commercial paper (CP), securities lending, prime brokerage, and lines of credit. Most observers have taken a narrower view of “wholesale” short-term funding markets. We purposely take a comprehensive view of the participants (financial and real economy) and the markets, as we believe that the actions of participants in one market are interconnected with outcomes in other markets. The STFM relies on a complex ecosystem that has significant daily flows through a network of connections among a wide variety of participants in the financial system and the economy more generally, including banks, broker-dealers, corporations, hedge funds, mutual funds, insurance companies, and households.

The COVID-19 economic shock rapidly lowered market prices of equity and debt securities, yields rose across the length of the yield curve, uncertainty in the economy and asset-price volatility spiked, and credit spreads and bid-ask spreads widened. These effects of COVID-19 disrupted the orderly functioning of the STFM, leading to higher funding costs, a further increase in bid-ask spreads, and increased margin requirements and collateral haircuts. The timely and sizable interventions of the Federal Reserve in mid-March helped to restore confidence and lowered interest rates, resulting in increased liquidity, tighter spreads, and funding costs in line with historical norms. The discussion below summarizes these COVID-19–driven effects as witnessed in the various sub-markets of the overall STFM.

1.1. Relationship between the Repo and the U.S. Treasuries Markets

In March 2020, the COVID-19 economic shock and subsequent increased uncertainty led many market participants to simultaneously shore up their liquidity positions (i.e., engage in de-risking trades). Many investors seeking liquidity sold U.S. Treasuries principally because those were historically the most liquid and least price-affected securities in their portfolios. Foreign central banks and foreign investors sought dollar funding liquidity during March and April 2020 by selling U.S. Treasuries. However, despite these historical stability-enhancing characteristics, the combination of elevated uncertainty and the stress resulting from the rush for liquidity eventually led to higher bid-ask spreads and to substantial changes in the relationships between “on the run” and “off the run” Treasuries and between cash and futures markets.

The relationships among, and varying stresses in, the cash, futures, and repo markets in U.S. Treasuries observed during March 2020 are areas worthy of more granular focus. The repo market is a \$4 trillion market, and approximately 50% of the collateral backing this repo financing is Treasury securities. One example of this interconnection was seen with hedge funds, in Treasury securities funded by repo. Hedge funds are one of the principal sellers of U.S. Treasury futures. These funds hedge their short futures position by establishing a long position in the cash market, creating a “cash-futures basis trade.” The cash leg of this trade is often highly levered, using the repo market for financing. In March, as the Treasury market came under stress and as repo rates increased in some segments of the repo market, the economics of the cash-futures basis trade worsened and various funds found it necessary to unwind at least a portion of their positions. This unwinding of positions resulted in more outright sales of Treasuries in the cash market, adding further stress through a feedback loop. A similar dynamic was observed in the risk parity trades, where hedge funds lever up (through the repo markets) lower volatility fixed-income positions (e.g., government bonds) to create a risk-equalized portfolio across asset classes. Another point of stress arose as dealer intermediation became constrained, principally because of volume increases and price volatility. More specifically, dealers initially expanded their Treasury inventories in response to the general shift to liquidity, and reached internal risk and exposure limits, limiting their ability to provide additional liquidity and intermediation.

1.2. Relationship between the Repo Market, the Agency MBS Market, and the mREIT Market

The agency mortgage-backed security (MBS) market is a large, liquid, and generally low-volatility source of collateral for the STFM. In March 2020, similar to the U.S. Treasury market, the agency MBS market experienced increased economic uncertainty, higher yields, and material selling pressure as market participants sought liquidity. The combination of economic uncertainty and sales pressure led to both increased volatility and price declines. This combination also disrupted the traditionally stable pricing relationships between different mortgage pools (i.e., to be announced pools vs. pay-up spec pools). These various market movements, while not large in absolute terms, disproportionately and adversely affected levered participants such as mortgage REITs (mREITs). mREITs generally operate with a combination of leverage (mostly sourced via the repo market) and maturity transformation that renders them vulnerable to significant shocks to the values of MBS securities as a result of changes in interest rates or adverse conditions in the real estate market. While the mREIT market itself is not large, the decline in MBS prices, and the decline of premiums in the pay-up market where the mREITs were long, increased mREITs’ leverage to unsustainable levels and resulted in margin calls. In turn, various mREITs had to unwind their positions in agency MBS, which created a feedback loop in the agency MBS market. These sales and the related feedback are analogous to the hedge funds’ sales of Treasuries discussed above; the same interconnectedness dynamics were at work via the repo market. Another point of stress in the MBS market, also similar to that observed in the Treasury market, resulted from large dealer inventories, which constrained dealer intermediation and exacerbated the stress.

The Federal Reserve’s direct intervention, including purchasing both Treasuries and agency MBS, in conjunction with regulatory actions such as providing interim capital relief to banks to expand their ability to engage in market intermediation, helped to stabilize both of these markets. These actions were

effective for various reasons, including because they also stabilized the related repo funding markets. Said another way, in light of these interconnections, the Federal Reserve’s multi-faceted interventions significantly and simultaneously reduced stress in the cash market, the funding (repo) market, and the futures markets.

1.3. Commercial Paper and Certificates of Deposit Market

March 2020 also saw strains in the almost \$1 trillion CP market, as investors stopped rolling (or reinvesting proceeds from maturing securities) to preserve cash. In the normal course, secondary trading volume in CP and CD markets is limited as most investors purchase and hold these short-dated instruments to maturity. However, in March 2020, as some market participants, including money market mutual funds (MMFs; 21% of the CP market) and others, may have sought secondary trading, they experienced a “frozen market.” As a practical matter, both secondary trading and new issuances halted for a period. Dealers (including issuing dealers) faced one-sided trading flows and were experiencing their own liquidity pressures and intermediation limits, including those discussed above.

In another illustration of the interconnectedness among the capital markets and the banking system, issuers who found the CP/CD market frozen turned to other sources of borrowings to meet near-term needs and, perhaps more so, as a matter of shoring up their cash balances to mitigate risk. These other sources of credit included bank revolvers and corporate lines of credit. Borrowers drew down over \$275 billion in revolvers in 2020Q1. We believe the Federal Reserve’s prompt action in the CP market and establishment of USD swap lines with a number of central banks mitigated the potential adverse effects of these interconnections, including a more general draw on liquidity from banks, which in turn could put further pressure on intermediation and other banking system activities important to orderly market functioning.

1.4. Role of Money Market Mutual Funds in the Short-Term Funding Market

MMFs are key participants in the STFM. MMFs’ assets under management (AUM) grew by \$705 billion in March and by \$462 billion in April to \$5.2 trillion, or an increase of 29% from the end of February. Government funds benefited with net inflows of \$1.2 trillion, and they ended April with \$4 trillion in AUM.

Assets in prime institutional and retail MMFs increased by \$105 billion in April after declining by \$125 billion in March to \$1.1 trillion, roughly \$20 billion below their February level. In March 2020, prime MMFs, especially those offered externally to institutional investors, experienced substantial outflows. Over the two-week period from March 11 to 24, net redemptions from publicly-offered prime institutional funds totaled 30 percent of the funds’ assets (about \$100 billion). These outflows likely contributed to stress in the CP/CD markets. These outflows caused weekly liquid assets (WLAs) in prime institutional MMFs to decline, and some funds’ WLAs (which must be disclosed publicly each day) approached or fell below the 30 percent minimum threshold required by SEC rules. Staff outreach to market participants indicate that prime fund outflows accelerated as WLAs fell close to 30 percent. The Federal Reserve’s announcements of liquidity facilities, including the Money Market Mutual Fund Liquidity Facility (MMLF), helped to restore market liquidity and improve market sentiment within days.

2. Market Structure/Liquidity Related Stresses

The market structure of certain segments of the credit market, particularly those that are still dominated by dealer-based intermediation for liquidity, contributed to the market stress related to the COVID-19 economic shock. These market segments include municipal credit and corporate credit, including certain aspects of the STFM such as CP. These observed stresses provide insight into issues presented by market depth, structure, and liquidity in times of high volumes and a sharp, market-wide change in preferences such as a general flight to safety.

Widely distributed and diversified ownership of credit, which is generally viewed as stability-enhancing, characterizes corporate and municipal credit markets, including both securities and bank loans. In addition, there are enormous numbers of relatively small issues and investors in these markets. As a result, secondary trading in the cash markets for individual securities and loans is sparse. And, in turn, the amount of capital devoted to intermediation in these markets is limited, resulting in relatively low levels of liquidity compared to market size. As a frequently discussed example, bond and credit mutual funds and exchange-traded funds (ETFs) own assets that would take longer to sell than the period in which they are required to pay redemption proceeds, so they are subject to regulatory requirements to manage their liquidity risks. These risks differ based on structure, holdings, redemption practices, and other factors, and would also vary if a fund were faced with general market stress and/or sudden, relatively large requests for redemptions. The COVID-19 economic shock induced large, simultaneous redemption shocks that strained liquidity in the market. This strain was exacerbated by the fact that, in the face of the severe buy-sell order mismatch, dealers also might have been reluctant to buy and thus meet sellers' liquidity needs.

2.1. Corporate Bond Market

During the COVID-19 economic shock and related market stress, the corporate bond market experienced greater risk and, therefore, various market actions including increased trading volumes and increased trading costs (presumably as a result of elevated credit spreads). Compared to the preceding two years, the average daily trading volumes for corporate bonds in March and April increased by approximately 48% and remained elevated through May, before returning to their typical levels in June and July.

Prior to the Federal Reserve's decisive action to add liquidity, transaction costs, as measured by effective bid-ask spreads, spiked to historical levels in March 2020. Recent research by staff of the Federal Reserve Bank of New York shows that bid-ask spreads spiked by as much as 100 basis points for high-yield (HY) bonds and 150-200 basis points for investment grade (IG) bonds in March, before declining rapidly after the announcement of the Federal Reserve's corporate credit facilities. By April, bid-ask spreads had stabilized, though they remained mildly elevated relative to the period before the COVID-19 economic shock.

A number of factors affect bid-ask spreads, including liquidity, economic uncertainty, asymmetric information, and willingness to absorb inventory and take on the attendant risks. All these factors were likely at play in March, though it is difficult to determine precisely how much any one factor contributed to the behavior of spreads. The Federal Reserve Bank of Philadelphia's recent research

focuses on the inventory held by dealers. In particular, the authors estimate that dealer inventories began declining in early March, contemporaneously with widening bid-ask spreads. In this regard, it is noteworthy that dealers began accommodating customer demand again (by absorbing more inventory) only after the Federal Reserve introduced the Primary and Secondary Market Corporate Credit Facilities later in the month, which also may have been a factor in increasing (or sustaining the increase in) trading volumes.

Finally, though many observers have been concerned about the ability of bond funds to access liquidity to meet redemption requests during periods of market stress, these concerns did not materialize during the market turmoil in March. Commission staff estimate that bond mutual funds experienced \$255 billion of net outflows during March 2020, with another \$21 billion in outflows from bond ETFs. However, the overall trading volume in the corporate bond market dwarfs these values during the same period and, therefore, it is reasonable to conclude that bond fund redemptions did not materially disrupt this market or materially add to stresses experienced by the market. We also believe that the actions of the Federal Reserve and, subsequently, the CARES Act, substantially ameliorated the potential for fund redemption-driven stresses to contribute to the adverse impact on the market.

Secondary trading in corporate loans experienced generally analogous trading dynamics. This market segment, while closely interconnected with the corporate bond segment, is much smaller in size and structurally distinct, partly as a result of the packaging of certain corporate loans into collateralized loan obligations (CLOs).

In summary, the corporate bond market saw significantly elevated trading volumes in March and April of 2020, at the same time that trading costs and credit spreads witnessed peak levels. The increases in spreads were likely driven by a combination of elevated economic uncertainty and structural issues in the market—in particular, fragmented liquidity in the cash market and reduced dealer inventories. The Federal Reserve’s introduction of the corporate credit facilities and other actions (including purchasing ETFs) were instrumental in stabilizing this market. In addition, the price and consumer confidence stabilizing actions of the Treasury and Congress through the CARES Act have added further stability, including in the new issue market.

2.2. Municipal Securities Market

Municipal bond investors generally are retail, long-term holders of municipal securities, either directly or through funds. There are relatively few non-retail oriented active investors in the market.

Secondary market trading in the municipal securities market averages \$13.4 billion, which amounts to 0.3% of the outstanding par amount of approximately \$4 trillion. Further, there are approximately 38,500 securities traded per day or about 3.8% of all outstanding CUSIPs. Low trading frequency can frustrate the price discovery process and contributes to the municipal securities market’s reliance on pricing models and matrixes. As a result, municipal securities are vulnerable to less accurate and idiosyncratic valuations, which can mask the true cost of liquidity for a particular municipal issuer or individual CUSIP.

This market structure can be viewed as potentially amplifying the effects of the market stress around the COVID-19 economic shock, including relatively sudden outflows from municipal bond mutual funds and municipal bond ETFs. When funds become net sellers of municipal securities to raise cash in response to customer redemptions, the secondary trading markets in municipal securities not only experience increased selling pressure, but they lose important buyers. Given the tax and retail-oriented characteristics of this market, few other natural purchasers of municipal securities are in a position to respond quickly to provide additional liquidity to the market. In prior years, municipal bond dealers may have provided greater liquidity through their balance sheets, in response to market imbalances and increases in yields. However, in recent years, municipal bond dealer balance sheets have shrunk as dealers have shifted their intermediation activity from a principal to an agency-like business model.

This and other structural changes, as well as general economic uncertainty, not only increased the costs of trading, but also impaired the ability of municipalities to raise funds in March 2020. The short-term new issue market was particularly stressed during this period. Again, this stress was relieved by the direct and indirect effects of the multi-faceted actions of the Federal Reserve as well as the price and consumer confidence stabilizing actions of the Treasury and Congress through the CARES Act.

3. Long-Term Credit Markets: Current and Potential Stresses

The COVID-19 economic shock in March 2020 was among the worst the U.S. economy has ever encountered. While the long-term economic impact from COVID-19 is still playing out and the long-term effects are difficult to predict, it is clear that the performance of certain key long-term credit markets in periods of severe stress warrants further monitoring and analysis. It should be recognized that: (i) long-term credit—e.g., residential and commercial mortgages, corporate bonds and leveraged loans, and municipal bonds—accounts for a large fraction of the \$54 trillion of credit in the U.S. financial system; (ii) as a general matter, these markets are most affected by aggregate and sector-specific macroeconomic conditions and interest rates; and (iii) however, in times of stress, these markets become significantly more affected by (interconnected with) the performance of other markets, particularly including the short-term credit markets.

3.1. Credit Concentration

Of the \$54 trillion of credit in the U.S. financial system, \$13.2 trillion of credit exposure is concentrated in banks, \$9.4 trillion is concentrated in federal agencies and government-sponsored enterprises (GSEs), and \$5.7 trillion is concentrated in investment companies.¹ Banks' ownership of credit includes residential and commercial mortgages and corporate loans. In the wake of the COVID-19 economic shock, in Q1 and Q2 of 2020, banks booked near-historically high amounts of current and estimated future loan losses. Because banks were well capitalized and generally were not carrying large inventories of credit-sensitive instruments, they have not experienced significant balance-sheet stresses in coping with the general economic shock. The institutional stability, combined with and enhanced by the actions of the Federal Reserve and other governmental actions, in particular, the CARES Act, has enhanced market stability. However, long-term uncertainties about the economic effects of COVID-19 on the performance

of credit remain. In addition to credit exposure, banks' performance and health more generally depend on the economic health of their borrowers. Thus, banks and other financial institutions remain exposed to potential long-term adverse economic effects related to COVID-19.

The federal agencies and GSEs retain most of the credit risk associated with the \$9.4 trillion mortgage credit portfolio they intermediate. Large-scale unemployment in March–April 2020, due to the COVID-19 economic shock, has led to increased incidence of and risk of mortgage payment defaults as well as forbearance. Forbearance rates peaked at 8.55% of mortgages outstanding in June 2020.² However, housing prices have remained relatively stable, likely due to a combination of the easing of mortgage credit, forbearance measures, and consumer-oriented fiscal stimulus, including the Paycheck Protection Program in the CARES Act. As with banks' credit portfolio, the long-term impact has yet to unfold, but the uncertainty is a potential risk to be managed by the federal agencies and GSEs.

Over the past several years, the GSEs issued credit risk transfer securities (CRTs), which were designed to transfer a portion of mortgage credit risk from the GSEs to CRT investors. More specifically, CRTs were designed to transfer a slice of mortgage credit risk from taxpayers and the GSEs to a diversified pool of investors. The CRTs account for the credit risk of a reference pool of approximately \$2 trillion of mortgages. A potential risk with CRTs is that the CRT market itself is exposed to stress because some investors finance their CRT exposure in a manner that creates potential stresses. For example, using CRTs as collateral to secure short-term funding can be viewed as akin to adding leverage to an already implicitly levered instrument, putting in place a structure that, in the context of an unexpected shock, may require a rapid unwind, potentially transferring risk and stress to those funding markets.

Banks, followed by GSEs and insurance companies, are concentrated holders of CRE mortgages—typically the nonstandard mortgage loans (e.g., floating-rate, construction, or owner-occupied)—and hold nearly \$2 trillion of this risk. If the COVID-19 economic shock adversely affects CRE property prices, CRE mortgages, and therefore banks, will experience increased stress. It can be expected that, if this market comes under increased pricing pressure, banks will act to further reduce their exposure.

3.2. Corporate Bonds

In recent years, the composition of corporate bonds has skewed toward BBB-rated bonds—i.e., low investment grade rated (IG) bonds. While issuers' market-valued leverage and interest coverage ratios in 2019Q4, the period leading up to the COVID-19 economic shock, were at near historically low levels, extended disruption from COVID-19 could cause financial stress in the corporate bond market. Such longer term stress could lead investors—for example, insurance companies and pension funds—to incur significant losses as these bonds are downgraded/repriced. Insurance companies own \$5.6 trillion of credit with a substantial fraction of it through corporate bonds. As monitoring and analysis continue, it is important to note that many of the investors in longer term credit operate with leverage.

3.3. Institutional Leveraged Loan and CLO Market

Institutional leveraged loans account for a relatively small portion of total debt outstanding in U.S. markets. Nonetheless, leveraged loan and collateralized loan obligation (CLO) markets have connections across a wide range of participants in U.S. capital markets. As with corporate bonds more generally, they expose levered lenders like banks and insurance companies to highly levered borrowers (e.g., leveraged buyouts). Thus, despite their small size, these markets should be monitored, including because they provide insight into market function and have the potential to contribute to certain market stresses.

CLOs hold about half of the \$1.2 trillion in leveraged loans outstanding. Registered investment companies (RICs) and private funds hold the bulk of the remainder, each accounting for approximately 15% of the leveraged loans outstanding. A wide range of institutional investors own CLO securities. Insurance companies, U.S. bank holding companies, and RICs respectively hold 25%, 16%, and 9% of CLOs outstanding, and they collectively account for approximately half of the total. These entities typically hold high-rated CLO tranches. Private funds, pension funds, and CLO sponsors hold the other, lower rated tranches and the equity layer.

The risk profile of the leveraged loan and CLO market has increased in recent years, including as a result of a greater concentration of covenant-lite (“cov-lite”) loans (i.e., loans lacking maintenance covenants, which, as a result, provide holders with fewer rights relative to more senior lenders in times of issuer stress) entering into the CLO loan pools. The COVID-19 economic shock to date has not appeared to significantly impair the CLO market. If leveraged issuers suffer financially in the future, their defaults could adversely affect CLO prices and potentially create defaults in the lower rated tranches of the CLO securities. Risk to the financial system more generally appears to be mitigated as a result of various factors, including because the CLO investor pool is diversified across bank holding companies, insurance companies, pension funds, RICs, and hedge funds, and as a general matter CLO structures have features designed to match funding and absorb risk. These factors should continue to be monitored.

An Overview of Six Key Segments of U.S. Credit Markets

The summary below presents the size and other general characteristics of six key segments of the U.S. credit markets. These characteristics provide a grounding for our analysis of the functioning and, importantly, the interconnections among these market segments under various conditions, including times of stress.

To varying degrees, the functioning of the markets discussed below in response to the COVID-19 economic shock illustrates starkly the highly interconnected nature of the U.S. credit markets. While the size of these markets varies, each experienced market stress in March 2020. Those stresses were inextricably linked through (i) direct connections among market segments, with the STFM being a focal point of interdependency; (ii) the actions of financial intermediaries and other market participants; (iii) broader economic conditions; and (iv) monetary and fiscal policy.

1. Short-Term Funding Market

The STFM finances the government, financial markets, and nonfinancial corporations collectively with a size of approximately \$10 trillion. The STFM comprises several sub-markets, including repo financing, CP, securities lending, prime brokerage, and lines of credit.

Repo market: The approximately \$4 trillion repo market provides secured, short-term, marked-to-market funding against various forms of securities collateral. The market is critical to the liquidity and, accordingly, to the operations of various market participants including market makers in virtually all sectors of the capital markets.

Commercial paper and certificates of deposit market: In March 2020, CP and CDs outstanding were approximately \$2.5 trillion. CP is a broad term encompassing various forms of short-term debt (various maturities of less than 1 year) issued by financial firms, nonfinancial firms, and municipalities to meet short-term financing and liquidity needs. CP can be asset-backed (for example, backed by a pledge of receivables) or, more simply, backed by the general credit of the issuing entity.

Securities lending market: Securities lending supports the orderly operation of capital markets, principally by enabling the establishment of short positions and thereby facilitating price discovery and hedging. The Financial Stability Oversight Council (FSOC) Annual Report estimates the global securities lending activity to be \$2.4 trillion with around 55% or \$1.3 trillion of it attributed to the United States (as of September 2019).

Prime brokerage: Financial institutions' prime brokerage activity includes the provision of secured financing to hedge funds and other active participants in the capital markets. A market participant's portfolio generally backs this lending. Staff understand that the size of this activity is approximately \$800 billion–\$1 trillion.

Lines of credit: As of year-end 2019, revolving credit-line commitments extended to businesses by large banks reached \$3.6 trillion.

2. Corporate Bond Market

The U.S. corporate bond market is approximately \$9.1 trillion in size. Corporate bond ownership is widely dispersed among insurance companies, RICs, pension funds, and family offices. Banks own only a small amount of corporate bonds in their capacity as dealers. Although the corporate bond market is large, the number of bond issues is in the tens of thousands, with the median size of an issue approximately \$500 million. The diversified and in some ways fragmented nature of the bond market spreads risk, but it also reduces liquidity in the cash market for bonds.

3. Leveraged Loan and CLO Market

Following rapid growth since 2012, \$1.2 trillion of syndicated leveraged loans are currently outstanding in the United States, and CLOs account for about half of those loans. As the market for leveraged loans has expanded, the risk profile of CLO pools has increased. The average credit rating of loans in the CLO pools has steadily declined, and currently more than 85% of the loans are cov-lite.

4. Municipal Securities Market

The U.S. municipal securities market has nearly \$4 trillion outstanding (par value) spread across approximately one million securities issued by more than 50,000 municipal entities (representing an even larger number of ultimate borrowers). States, counties, cities, school districts, and other municipal entities issue municipal securities to finance infrastructure and other projects—e.g., hospitals, transportation systems, school buildings, and utilities.

5. Residential Mortgage Market

Residential mortgage debt outstanding was \$10.6 trillion in 2019Q4. Of this, federal agencies and GSEs intermediate about \$7 trillion, but they retain the credit risk. The GSEs sell the mortgages as agency MBS to a diversified pool of investors, including the federal, state, and local governments; insurance companies; pension funds; RICs; mREITs; and banks. Banks own approximately \$3.2 trillion of the mortgage loans retaining the credit risk. Residential mREITs invest about \$335 billion in agency MBS financed with a highly levered, short-maturity capital structure.

The federal agencies and GSEs sell CRT securities on a reference mortgage pool of approximately \$2 trillion. These securities transfer credit risk of the reference pool of mortgages to the investor in the CRT security, including hedge funds, real estate investment trusts (REITs), RICs, insurance companies and banks.

6. Commercial Real Estate Market

CRE mortgage debt grew steadily over the last decade to \$4.6 trillion by 2019Q4. CRE mortgage risk is concentrated among a few entities: Banks are the largest holders of CRE mortgages followed by GSEs and insurance companies. The CRE loans on the banks' balance sheets are often nonstandard mortgages compared to the loans banks supply to commercial MBS (CMBS) for securitization.

1 Investment companies include open-end funds, closed-end funds, unit investment trusts, and ETFs.
2 Mortgage Bankers Association, "Share of Mortgage Loans in Forbearance Increases to 8.55%," June 16, 2020.

Chapter 1: Overview Of The U.S. Credit Markets

Key Highlights

1. At the end of 2019, the aggregate U.S. credit outstanding was \$54 trillion with a diverse set of issuers and holders of credit and numerous intermediaries who facilitate about \$23 trillion of credit transmission.
2. Banks are a concentrated holder of credit risk of \$13.2 trillion. Federal agencies and GSEs intermediate about \$9.4 trillion of residential mortgages. They retain most of the credit risk on mortgages, but sell (intermediate) the underlying mortgages as agency MBS.
3. Pension funds and insurance companies are large holders of corporate bonds.
4. MMFs intermediate about \$3.6 trillion of short-maturity credit and RICs and REITs intermediate \$6.4 trillion of mostly long maturity credit.

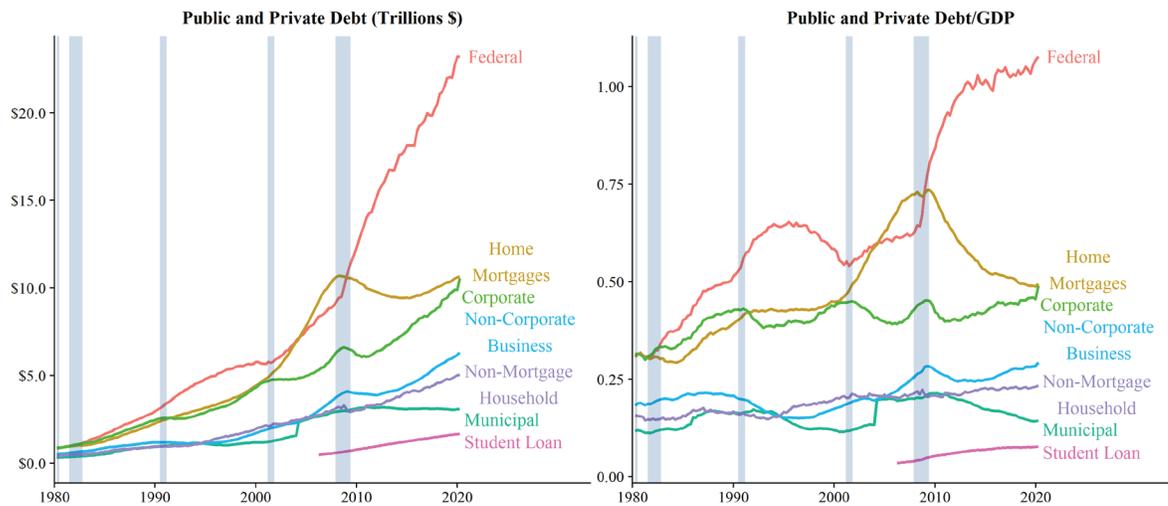
The stress induced by the COVID-19 economic shock has affected and may continue to affect the U.S. credit markets. Understanding the breadth and complexity of the U.S. credit markets is fundamental to any assessment of the events of March 2020. While identifying all relevant connections within the U.S. credit markets is challenging, some connections, such as ownership and funding relationships, are transparent and direct. Other connections, such as leverage and synthetic exposure, are obscure and indirect. We begin by identifying the amount of credit issued and outstanding in the U.S. capital markets. We then identify credit risk transmission and distribution from the origins to the ultimate holders of this risk—investors. Many intermediaries facilitate the flow of credit from the issuers to the holders of credit.

The size and composition of the credit market is not static. All types of debt grew in the last decade in nominal terms, and most of them grew relative to GDP, with the notable exceptions of mortgage and municipal debt, which have declined relative to GDP (See Figure 1.1). Moreover, the composition of aggregate debt has changed: the relative size of mortgage and municipal debt has declined, while federal and corporate debt has increased.

As of the end of 2019, we are able to track the origin and transmission of \$54 trillion of U.S. credit issued and outstanding (See Appendix). We are able to identify the ultimate holders of about \$52 trillion of the credit, held both directly and indirectly through chains of intermediaries. Figure 1.2 maps the distribution of all credit in the U.S. credit markets. An immediate takeaway from this figure is that the U.S. credit markets are a complicated mosaic of connections large and small among a diverse set of institutions. Each of them connects with the rest through numerous holders of credit and credit intermediaries.

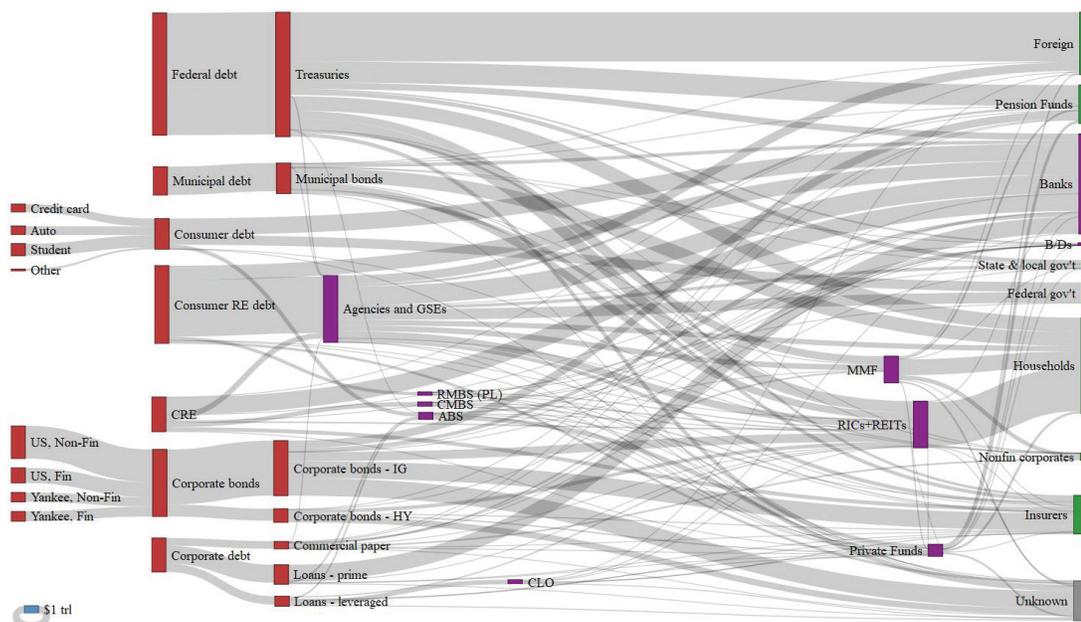
The high-level view of the credit market in this report excludes several critical features of the market in the interest of simplicity. For example, the report does not focus on credit risk exposure between financial institutions that might arise from derivative securities, committed lines of credit, credit guarantees, and central clearing parties and advisory and credit evaluation entities (consumer credit reporting agencies, investment advisors, and pricing services/index providers). Instead, subsequent chapters address the following in the context of individual markets to give a deeper insight into the U.S. credit market: (i) STFM, which includes repo financing, CP/CDs, securities lending, prime brokerage, and lines of credit; (ii) the corporate bond market; (iii) the market for leveraged loans and CLOs; (iv) the municipal securities market; (v) the residential mortgage market and other consumer lending markets; and (vi) the CRE mortgage market.

Figure 1.1. Public and Private Debt by Category, 1980-2020



The left panel plots the amount of debt for several borrower types in trillions of dollars, and the right panel scales the amounts by GDP. Sources: Financial Accounts of the United States and the Federal Reserve Board.

Figure 1.2. Overview of U.S. Credit Outstanding as of December 31, 2019



This figure shows ultimate borrowers (sources of credit risk, in red) on the left, and ultimate lenders (owners of credit risk, in green) on the right, with financial intermediaries in purple. Credit risk flows from left to right, and money flows from right to left. The width of the shaded bands represents the stock of credit outstanding as of December 31, 2019 (\$1 trillion shown at bottom left for scale). Data sources and other technical details are in the Appendix.

Several observations emerge from the high-level view of the credit risk map. First, the federal government (\$16.6 trillion), households (\$10.6 trillion of mortgages and \$4.2 trillion of other consumer debt), and corporations (\$13.7 trillion in bonds and loans) are the primary issuers of credit. Naturally, the amount of credit differs across issuers, and the issuers themselves are not homogenous. While the risk of credit issued and outstanding from the U.S. federal government is low, the risk of credit issued and outstanding from corporations can vary from those issuing lower risk IG bonds and CP to those issuing higher risk HY bonds.

Second, the largest ultimate holders of credit are households with about \$14 trillion of credit risk exposure (\$4.4 trillion directly and \$9.2 trillion indirectly through nonbank financial intermediaries, e.g., mutual funds). Another important channel of households' exposure to credit risk is banks that own \$13.2 trillion of credit risk. Households, in turn, have deposits in banks and are thus exposed to the (minimal) credit risk of such deposits. Other major holders of credit in the capital market are foreign buyers who hold more than \$10.9 trillion, insurance companies that hold about \$5.6 trillion, and pension funds with more than \$4.8 trillion. The latter two categories also create indirect credit risk exposure for households and businesses that hold insurance or pension claims or for pension plan sponsors that may guarantee pension payments. The map also does not display household and corporate claims on banks through their deposits.

Third, nonbank intermediaries are salient in the U.S. credit markets. They account for approximately \$23 trillion of credit that flows from issuers to holders of credit.³ Federal agencies and GSEs intermediate \$9.4 trillion, MMFs intermediate \$3.6 trillion, and RICs and REITs another \$6.4 trillion. Smaller intermediaries include private funds with \$1.6 trillion, and private-label CMBS, residential MBS, CLO, and other asset-backed securities (ABS) with \$2.6 trillion.

Fourth, the credit claims, while many and diversified across different types of entities, exhibit pockets of concentration that pose potential risk in times of economic stress and/or market disruption. For example, federal agencies and GSEs own a significant share of residential real estate claims (72%) and, correspondingly, the mortgage market depends on agencies and GSEs. Banks hold the majority of corporate loans (62%) and half of CRE loans; hence, corporations depend on banks and banks' credit policies for the extension of credit. Similarly, CLOs own the majority of leveraged corporate loans (54%). Insurance companies own close to one third of all corporate bonds.

Finally, households invest directly in Treasury and municipal securities but have exposure to other types of debt primarily through intermediaries like MMFs and RICs.

³ The numbers in this section represent only the credit portion of the total assets of the intermediaries; some credit exposure goes through several intermediaries before reaching the ultimate lender.

Chapter 2: Short-Term Funding Market

Key Highlights

1. The U.S. STFM provides approximately \$10 trillion of funding to the federal government, state and local governments, banks, and other financial and nonfinancial firms.
2. The uncertainty and market volatility from the COVID-19 economic shock caused a sharp, unexpected increase in demand for cash and short-dated, near-cash investments and disrupted the STFM. This disruption resulted in significantly constrained liquidity, higher funding costs, increased bid-ask spreads, and increased margin requirements and collateral haircuts.
3. Initially, stresses were observed in the U.S. Treasury and MBS markets, which caused a feedback loop as levered investors were forced to unwind.
4. Securities dealers are central to market participants and serve as liquidity providers facilitating provisioning of credit, risk transfer, and price discovery for other market participants. During March 2020, facing internal limits, their ability to continue intermediation was constrained.
5. The Federal Reserve's timely and sizable interventions restored confidence in the market participants and the STFM.

Market Overview

A well-functioning STFM is critical to the performance of the real economy as well as to the broader credit and equity markets.⁴ Using data from the Financial Accounts of the United States in conjunction with industry sources, we size the STFM at approximately \$10 trillion. These markets consist of several key, interconnected segments. The market uncertainty induced by the COVID-19 economic shock caused a sharp, unexpected increase in demand for cash and short-dated, near-cash investments and related liquidity. This demand shift disrupted the STFM, resulting in higher funding costs, increased bid-ask spreads, and increased margin requirements and collateral haircuts in some market segments. The Federal Reserve's timely and sizable interventions in mid-March restored confidence in the stability and operation of these markets, resulting in increased liquidity, tighter spreads and funding costs in line with historical norms.

The COVID-19 economic shock in March 2020 dramatically slowed macroeconomic activity, lowered valuations of financial assets such as equities, bonds, and real estate, and generally reduced the risk appetite of market participants. These factors adversely affected the STFM, directly and through the multiple connections between the STFM and both the real economy and

other financial markets. The most immediate and direct effect on the STFM was due to a steep increase in demand for safety and liquidity. That resulted in demand for the most cash-equivalent assets and selling pressure in virtually all other markets, including in the more long-dated and relatively less secure segments of the STFM.

The sharp shift in market participants' preferences, labeled by some as a "dash for cash," and the resulting market conditions led to additional stresses. For example, heightened volatility and lower valuations of various financial assets triggered margin calls in certain segments of the short term credit markets (e.g., repo markets) and also prompted dealers to demand larger collateral haircuts. These risk-mitigating actions by providers of collateral-based credit had the effect of removing liquidity from the STFM. The CP market also became constrained, resulting in higher costs of borrowing as issuers' risk profiles worsened in absolute terms while investor demand shifted to relatively safer short-term investments.⁵ The spike in demand for safe, liquid assets, which was initially driven by a shift in investor demand, was exacerbated by de-levering transactions as some market participants were forced to unwind leveraged exposures. Collectively, these factors led to increased spreads, mismatch in the supply of and demand for short-term funding, and a magnified liquidity-induced stress, and had the potential to further magnify, the effects of the COVID-19 economic shock on the STFM.

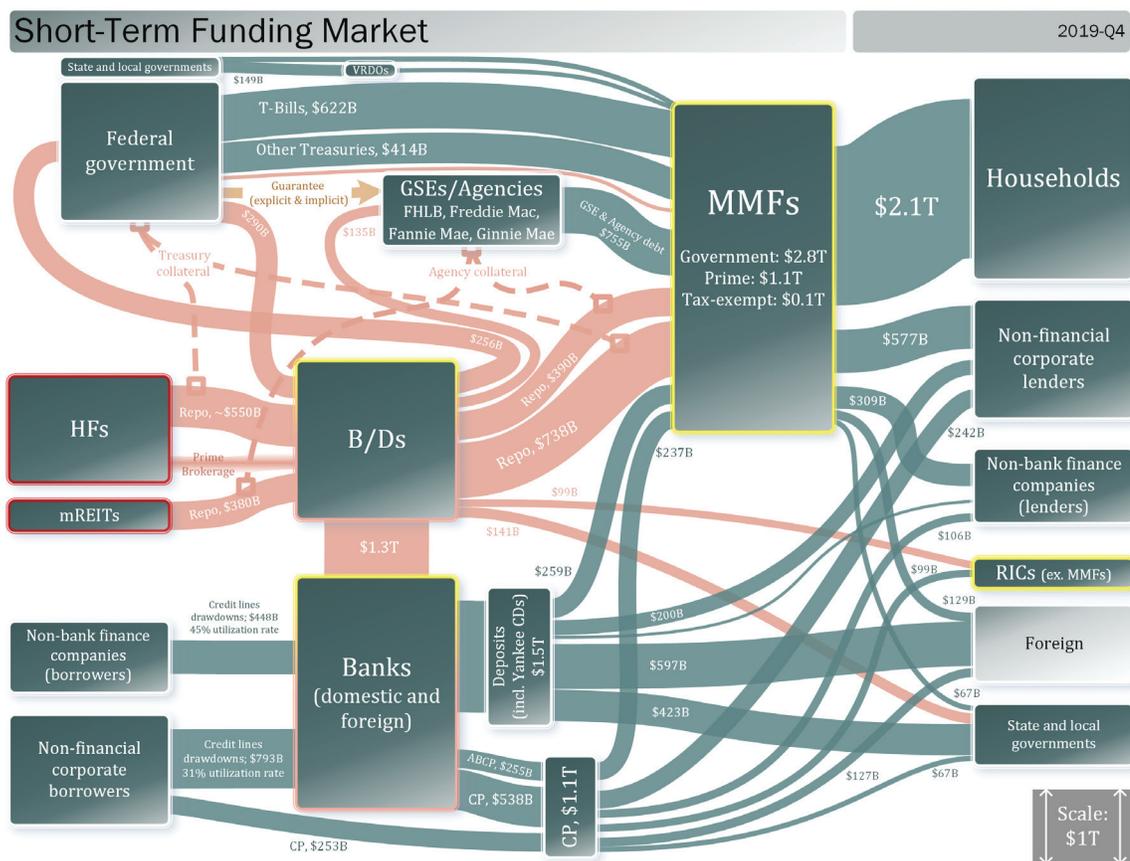
Below, we discuss the size, structure, and role of the STFM, including its functioning in both ordinary market conditions as well as during the COVID-19 economic shock of March 2020. We believe an understanding of the STFM is critical because of its importance, which has grown substantially over time, in both absolute terms and relative to bank lending, in providing short-term liquidity to the real economy and financial markets. In short, the STFM is essential to both—and a key link between—the real economy and the financial markets more generally.

The discussion below presents a granular view of key segments and the primary market participants of the STFM and provides detailed observations from March 2020.

Short-Term Funding Market Structure

The STFM encompasses many large (e.g., MMFs) and small participants, many sub-markets (e.g., repo financing, CP, securities lending, and prime brokerage), and it has many interconnections among these participants as well as participants outside of the STFM, e.g., corporations, hedge funds, mREITs, and households. The complexity of the STFM is evident from Figure 2.1, which portrays various participants, their relative size, and their interconnections. Instead of describing the entire STFM as one single market, or separate market segments, the discussion below summarizes the structure of each sub-market along with its interconnections to other segments, as well as how those segments performed and the interconnections operated in response to the COVID-19 economic shock.

Figure 2.1. Short-Term Funding Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$1 trillion shown at bottom right for scale). Data sources and other technical details are in the Appendix. The figure does not include securities lending and prime brokerage activity because of the lack of reliable disaggregated (and in some cases, reliable aggregated) data. The figure also nets some repo connections for simplicity.

Repurchase Agreements (Repo) Market

The approximately \$4 trillion repo market provides secured, short-term, marked-to-market funding against various forms of securities collateral.⁶ The collateral from several short- and long-term funding markets and participants connects the repo market to the rest of the financial system. The repo market is a critical source of liquidity and, accordingly, essential to the ongoing operations of various market participants, including market makers in virtually all sectors of the capital markets.

A repo contract in essence offers an interest-bearing cash loan against securities collateral, but the contract can also be structured to borrow securities. As seen from Figure 2.1, broker-dealers (many of the larger ones being bank affiliates), MMFs, hedge funds, mREITs, and the Federal Reserve are the primary participants in the repo market. The MMFs are the main investors of cash (i.e., the lenders) into the repo market. Recipients of repo financing (i.e., the borrowers) include hedge funds that pledge many different securities and mREITs that mainly pledge MBS securities in repo transactions. Broker-dealers intermediate virtually all repo transactions.

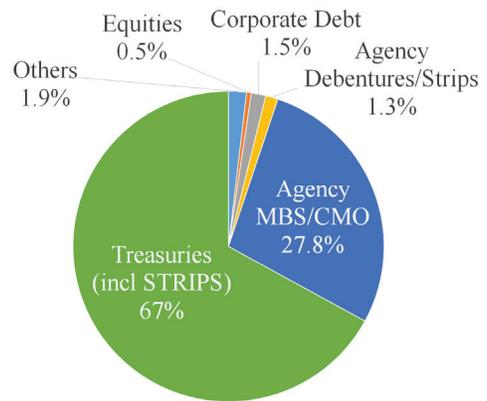
The repo market provides a quintessential example of the myriad interconnections among banks, brokers, and other market participants and the functioning and performance of capital markets. As illustrated in Figure 2.1, broker-dealers are the main point of connection among various participants in the repo market. Certain broker-dealers are bank-holding companies' subsidiaries, whereas others are stand-alone entities. A subset of broker-dealers are primary dealers, which are the trading counterparties to the Federal Reserve and must bid on each Treasury auction.⁷ Dealers use the repo market to finance their Treasury auction purchases. U.S. Treasuries also provide an efficient means of supporting short-term borrowings. Treasuries serve as collateral in nearly half of all repo transactions, and agency MBS in approximately one third of such transactions. The remainder of the collateral in this market (approximately one-fifth) consists of equities, corporate bonds, and non-agency MBS. MMFs' portfolio holding disclosures are another valuable source of information about the composition of repo collateral.⁸ Historically, close to 70% of collateral accepted by MMFs consists of Treasury securities (See Figure 2.2).

Dealers in their intermediation role participate on both sides of the market and account for approximately 40% of the borrowing and 33% of the lending.⁹ MMFs account for another 24% of investments (i.e., lending) in the repo market, followed by other smaller participants such as banks, government agencies, and hedge funds.

Market structure of the repo financing market.

Repo financing generally provides liquidity to market participants to facilitate intermediation and investment activities. As a result, when the prices of securities used for collateral decline materially and/or become more volatile, repo financing may become more expensive quickly because of its short-term nature and rollover risk. More expensive repo financing can exacerbate downward pricing pressure for the securities used as collateral and the securities markets more generally.

Figure 2.2. Repo Collateral by Type for MMFs



This figure shows the average monthly amount of repo collateral by security type from June 2018 to June 2020. Source: Form N-MFP.

The principal risks of the repo financing market are rollover risk and default risk, which may trigger the need for collateral liquidation. The repo market is predominantly structured on an overnight or short-term basis, but borrowers' funding obligations, at least as a practical matter, are likely to be longer term. Borrowers therefore expect to roll over the repo financing to meet their ongoing funding and operational needs. However, adverse economic shocks can rapidly shrink the availability of overnight and short-term financing because of various factors, including deterioration in the quality of collateral due to changing market conditions (e.g., price deterioration and widening of spreads). In addition, changes in investors' risk appetite can also alter the supply of liquidity. As a result, investors in the STFM in general, and the repo financing market in particular, can experience bouts of market illiquidity, particularly in times of unanticipated stress.

Collateral valuation affects the functioning of the repo market. Under normal market conditions, collateral securities are subject to relatively low and stable haircuts. Low levels of haircuts may enable repo borrowers such as hedge funds to assume significant leverage. Under less stable market conditions, the risk profile of collateral securities increases as holders of the collateral face greater uncertainty regarding the price at which they can liquidate the collateral if the borrower defaults. To protect themselves from potential losses, repo lenders may demand more substantial haircuts. This, in turn, could force repo borrowers to sell some of their positions in securities to reduce funding needs. In a feedback loop, such forced sales can exert additional pressure on collateral valuation as prices of securities decline further and lead to further increases in collateral haircuts.¹⁰

Impact of the COVID-19 economic shock. Reforms that followed the 2008 GFC, including a substantial increase in central clearing and strengthening tri-party repo segments, contributed to the orderly functioning of the repo market during the recent market stresses related to COVID-19. However, in March 2020, the repo market experienced decreased liquidity and increased pricing volatility, in significant part because of price dislocation and volatility in two of the principal markets underlying the repo market, U.S. Treasuries and agency MBS. As a result of interconnections, stress in the U.S. Treasuries and MBS markets propagated to the repo market. This is discussed in more detail below.

Relationship between the repo market and the underlying U.S. Treasuries cash and futures market. In March 2020, various significant market participants, including portfolio managers and central banks, sought to increase liquidity.¹¹ Forward central banks and foreign investors sought dollar funding liquidity during March and April 2020. Toward that end, many sold U.S. Treasuries principally because they were the most liquid and least price-affected securities in their portfolios.¹² However, even though these instruments were relatively highly liquid and suffered less price deterioration, the stress resulting from the rush for liquidity led to higher bid-ask spreads and substantial changes in the traditional basis between “on the run” and “off the run” Treasuries in the cash and futures markets.

One area worthy of greater focus is the relationships among, and the varying stresses in, the cash, futures, and repo markets in U.S. Treasuries in March 2020. Certain levered market participants are active in the U.S. Treasury futures market. For example, hedge funds are one of the principal sellers

of U.S. Treasury futures. These funds hedge their short futures position in the cash U.S. Treasury market, creating what is referred to as a “cash-futures basis trade.” The cash leg of this trade often is highly levered, using the short-term repo financing market. Accordingly, as the U.S. Treasury market came under stress, and as short-term repo liquidity deteriorated and pricing increased, the economics of cash-futures basis trades worsened and trades were unwound.¹³ This deterioration and unwinding of positions resulted in more outright sales of U.S. Treasuries, adding further stress. This included constraints on continued dealer intermediation due to volume and pricing dynamics. More specifically, dealers had already expanded their Treasury inventories in response to the general shift to liquidity. With dealers already facing internal limits, their ability to conduct additional market-making activities in response to the unwinding of these trades was constrained.

Relationships among the repo market, the agency MBS market and the mREIT market. The agency MBS market is large: approximately \$8.1 trillion of agency MBS and debt securities were outstanding on December 31, 2019 (See Figure 6.1 in Chapter 6). It generally functions well and it is stable from a liquidity and volatility perspective. It is an important market for housing finance as well as a significant source of fixed-income exposure for investors and, as a result, it is systemically important. In contrast, the mREIT market is not large or, in itself, not systemically important. However, certain mREITs own agency MBS on a highly levered basis, through funding obtained in the repo market. This dynamic—using short-term repo funding to finance the carrying of longer dated MBS—can result in a funding mismatch.

In March 2020, the agency MBS market, because of its relative high liquidity and stability, experienced selling pressure as market participants sought liquidity. These substantial sales increased volatility and lowered the price of MBS. For example, agency MBS prices fell 2.5% from peak to trough, and there was material widening in spreads between agency MBS and U.S. Treasuries.¹⁴ These market movements in the agency MBS market, while not large in absolute terms, disproportionately and adversely affected mREITs because they had portfolios of agency MBS that were both skewed to spec pools/pay-ups and significantly levered (approximately 7-9x) with short-term repo financing. The resulting margin calls and unwinding of positions created a feedback loop in the agency MBS market as mREITs were forced to sell their most liquid agency MBS securities. These sales, in a manner similar to the sales of U.S. Treasuries by hedge funds that had to unwind the cash-futures basis trades discussed above, may have contributed to the stress in this market.

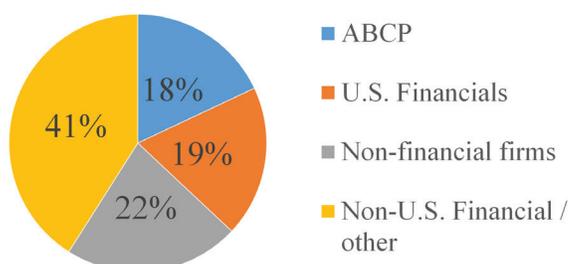
Again, large dealer inventories exacerbated the stress in the agency MBS market. In addition, reportedly, increased funding to bank intermediaries could not alleviate this stress because they were unwilling to take more agency MBS inventory on their books in light of balance sheet and quarter-end capital constraints. Accordingly, the Federal Reserve’s direct intervention, including purchasing agency MBS, and indirect regulatory actions, including providing interim capital relief to banks to expand their ability to engage in market intermediation, helped to stabilize the agency MBS-backed repo market. The intervention, in light of these interconnections, also significantly reduced stress in the agency MBS market more generally.

Commercial Paper and Certificates of Deposit Market

CP is a type of unsecured, short-term debt (with maturities typically ranging from several days to no longer than 270 days) issued by financial firms, nonfinancial firms, and municipalities to meet short-term financing and liquidity needs. CP can be asset-backed (for example, backed by a pledge of receivables) or, more simply, backed by the general credit of the issuing entity. CDs, including Yankee CDs, are approximately \$1.5 trillion.

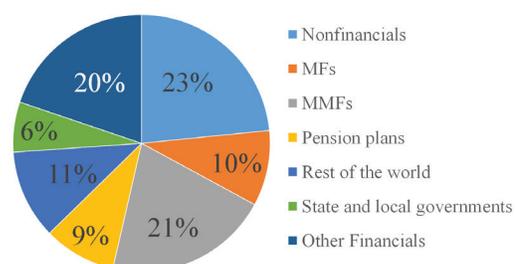
In March 2020, CP outstanding was approximately \$1 trillion, reflecting a decline in outstanding CP from an all-time high of \$2.2 trillion reached in July 2007. The overall decline has been due mainly to the reduction of asset-backed CP outstanding and reduction of reliance on this market by U.S. financials. Many non-U.S. firms, especially large financials, are the single largest category of CP issuers at 41% (See Figure 2.3a). As seen from Figure 2.3b, a diverse set of investors purchase CP to earn a slightly higher return than holding cash. The CP market thus has significant interconnections with the financial system, both within and beyond the STFM.

Figure 2.3a. CP Outstanding as of March 2020



Source: Financial Accounts of the United States

Figure 2.3b. CP Investors as of March 2020



Source: Financial Accounts of the United States

Secondary trading in CP/CD markets is limited in normal times, as most investors purchase and hold these instruments to maturity. In March 2020, as certain market participants sought secondary liquidity, they witnessed what can be described as a “frozen market.” The secondary trading in CP/CD generally is limited to the dealers marketing CP/CD programs. In March, because of the COVID-19 economic shock, these dealers were constrained in supporting these markets. This market characteristic also contributed to the lack of liquidity in this market.

The freezing of the CP market had ripple effects because of its connections to other participants in the financial system. Specifically, CP issuers had to turn to other sources of borrowings to meet their near term needs, including for example drawing on bank revolvers, and investors in CP/CD had to sell or otherwise transact in other investments (e.g., Treasuries and agency MBS as discussed above) to meet their immediate liquidity needs. The Federal Reserve’s liquidity facilities provided significant stability to these markets and liquidity relief to the participants and improved market sentiment.

Securities Lending

Securities lending supports the orderly operation of capital markets, principally by enabling the establishment of short positions and thereby facilitating price discovery and hedging. The FSOC Annual Report estimates the global securities lending activity to be \$2.4 trillion with approximately 55% or \$1.3 trillion of it attributed to the United States as of September 2019. The securities lenders are typically large asset managers, insurance companies, and pension funds, whereas the borrowers are typically securities dealers that provide secondary securities loans to their clients, such as hedge funds. The securities lending market also connects with the STFM because of the way collateral received from the securities lending can be reinvested. In the U.S. markets, a large part of collateral is in the form of cash, which can be reinvested in various money market instruments.

The COVID-19 economic shock stressed the securities lending market because the fall in asset prices in March 2020 led to deleveraging, including by borrowers of securities. The lower asset prices and lower demand for securities lending in general reduced the amount of cash in the hands of securities lenders for investment in short-dated funding markets, thereby reducing the supply of liquidity in the STFM. As an example, industry data suggest that there was a 30% decline in securities lending cash collateral that was reinvested in the CP market in 2020Q1.¹⁵

Prime Brokerage

Financial institutions' prime brokerage activity includes the provision of secured financing to hedge funds and other active participants in the capital markets. A market participant's portfolio generally backs this lending. Staff understand that prime brokerage activity is approximately \$800 billion–\$1 trillion, but specific data about prime brokerage activity is not available. Industry sources note that the largest prime brokers fund this business through three main sources: (i) internalization, (ii) external repo financing, and (iii) on-balance-sheet funding. These sources of funding link the prime brokerage market to the broader financial system.

Regulators and market participants should be cognizant of the size and structure of this segment of the STFM, as it has historically exhibited a high degree of funding volatility, and it has increasingly become more concentrated with a few larger broker-dealers now dominating the business. This market is interconnected with the broader banking system, repo market, securities lending and other STFM sub-markets (via the banks who fund this business).

In connection with the market stresses of March 2020, hedge funds delevered their portfolios. There was an overall reduction in margin balances desired by hedge funds, and as a result, their demand for securities on loan (their short positions) also declined, and those securities lenders returned cash collateral.

Money Market Mutual Funds

With about \$5 trillion of assets as of June, 2020, MMFs are an important participant within the STFM. Companies invest their excess cash in MMFs, financial institutions manage their liquidity demands such as margin call and redemptions through MMFs and many households invest their savings in MMFs.

MMFs can be identified as government MMFs (approximately \$3.8 trillion in net assets as of June 2020), prime MMFs (approximately \$1.2 trillion), and tax-exempt MMFs (approximately \$137 billion). Government MMFs must invest almost exclusively in cash, short maturity government securities, and repos backed by these securities. Prime MMFs invest in short-term debt issued by governments, financial and nonfinancial companies, and repurchase agreements backed by such securities. Prime MMFs that cater to natural persons are known as prime retail MMFs and had around \$455 billion in net assets in June 2020, while prime MMFs offered to other investors, known as prime institutional MMFs, had \$707 billion. Furthermore, some prime institutional money market funds are not offered publicly. Typically, these funds disclose in their filings and public communications that their shares are not intended to be offered to the public.¹⁶ Prime institutional money market funds not providing such disclosures are considered to be offered to the public. Through their participation in the STFM, MMFs serve an important financial and economic function for both retail and institutional investors and for the capital markets. For example, MMFs invest about \$250 billion in CP, \$950 billion in repos, and \$540 billion in short-term securities issued by Federal Home Loan Banks (FHLB). About 21% of outstanding CP is purchased by MMFs.

March 2020 Events and Stress in Prime MMFs

Amid escalating concerns about the impact of the COVID-19 economic shock and increased demand for liquidity, prime and tax-exempt MMFs experienced heavy redemptions beginning in the second week of March 2020. The scale of the outflows was the most substantial among prime institutional MMFs that are publicly offered. Over the two-week period from March 11 to 24, net redemptions from publicly-offered prime institutional funds totaled 30 percent (about \$100 billion) of the funds' assets.¹⁷ The outflows from prime institutional MMFs that are not publicly offered were much smaller, around \$17 billion or 6 percent of assets.¹⁸ These non-public prime funds had smaller outflows than their public counterparts, likely because the former do not have the same vulnerabilities as funds that are offered publicly to unaffiliated institutional investors. For prime retail MMFs, outflows as a share of assets in March 2020 totaled \$33 billion, or 7 percent of assets.

Government MMFs had record inflows of \$838 billion in March and an additional \$347 billion in April. The assets in government MMFs grew to about \$4 trillion by the end of April 2020 compared to about \$3 trillion at the end of 2019.

As prime MMFs experienced heavy redemptions, their weekly liquid assets (WLAs) dropped notably, and some funds' WLAs (which must be disclosed publicly each day) approached or fell below the 30 percent minimum threshold required by SEC rules. When a fund's WLA falls below 30 percent, it can impose fees or gates on redemptions. Market participants reported concerns that imposition of a fee or a gate by one fund could spark widespread redemptions from others. Preliminary research indicates that prime fund outflows accelerated as WLAs fell close to 30 percent.¹⁹

Staff understand that at least four factors contributed to rapid outflows from the prime MMFs in March 2020. First, the sudden economic shutdown due to COVID-19 reduced revenues for most industrial and service organizations of all sizes. In response, many firms might have sought to bolster their liquidity position by withdrawing from the prime MMFs. Second, increased economic uncertainty and greater market volatility in March 2020 lowered asset valuations. This may have adversely affected the marked-to-market valuation of swap and other derivative positions of certain investors who had cash in MMFs that they needed to withdraw and post as additional collateral positions. Third, in an environment of great uncertainty, many investors might have converted their assets sensitive to liquidity and credit risk into safer, more highly rated government debt, including government MMFs. Finally, some investors may have feared that if they were not the first to exit their fund, then in the event the fund breached the 30% WLA limit, there was a risk that they could be subject to restrictions on withdrawals known as “gates.” This anticipatory, risk-mitigating perspective potentially further accelerated redemptions.

Conditions in short-term funding markets deteriorated rapidly in the second week of March. Spreads for money market instruments widened sharply, and new issuance of CP and CDs declined markedly and shifted to short tenors. Spreads to OIS for AA-rated nonfinancial CP reached new historical highs, while spreads for AA-rated financial CP and A2/P2-rated nonfinancial CP widened to the highest levels seen since the 2008 GFC. Stress among prime MMFs likely contributed to these problems, as funds reduced their holdings of CP and CDs. In addition, MMFs with WLAs close to 30 percent were likely reluctant to purchase assets with maturities of more than 7 days that would not qualify as WLA.²⁰

Outflows from MMFs abated fairly quickly after the Federal Reserve’s announcement of the MMLF on March 18 and market conditions began to improve after the launch of the MMLF.²¹ The share of CP issuance with overnight maturity began falling on March 24, and spreads to OIS for most types of term CP began falling a few days later.

The March 2020 stress in the prime MMFs brought the economics of prime MMFs into question because investors expect immediate liquidity, which is more difficult to deliver in periods of heightened uncertainty that often increase the demand for simultaneous redemptions. This dynamic—which was present under different circumstances in the GFC of 2008—might have contributed to certain managers’ recent decisions to close some of their prime institutional MMFs.²²

In summary, the events related to the COVID-19 economic shock led to a decline in business activity worldwide and spurred the demand for cash and safe assets. This affected MMFs as investors drew on their cash balances to address their emerging funding needs and as they moved their other investments into the safe, liquid government MMFs. The effects included a significant net inflow into government MMFs and meaningful outflows from prime MMFs, which abated when the Federal Reserve established liquidity facilities for the assets in which MMFs invest.

Other Risks in the STFM to Highlight

FHLB/Government MMFs. As of April 30, MMFs held just over \$700 billion in discount notes issued by FHLBs, which at that time accounted for around 17% of government MMF net assets, and close to 60% of FHLB liabilities. These investments have gradually fallen to around \$540 billion in June 2020. After the 2008 GFC and the various money market and banking sector reforms that followed, the FHLB system has become increasingly dependent on MMFs as a source of short-term funding. The banking system in turn favors borrowing via the FHLB given regulatory ratio and cost efficiency. This interconnection did not become a stress point in March 2020 as there were sizable inflows of assets into government MMFs and demand for FHLB borrowing also dropped. Regulators and market participants should remain focused on this interconnection between banks, FHLB, MMF and STFM more generally, as an area for potential future market risks.

Derivatives/Margins/CCPs. One other key area of interconnection worth highlighting is the role of margin in the availability of liquidity among market participants. Since the 2008 GFC, there have been substantial reforms that have moved a significant number of bilateral, OTC derivative and swap transactions into central clearing counterparties (CCPs), that centralize the clearing risk and help remove specific entity counterparty credit risk, while bringing significant netting benefits to market participants.

In the aggregate, we have seen initial margin (IM) posted on new trades increase by approximately \$160 billion during 2020Q1 across all U.S. derivative CCPs, and we have seen the absolute posting of variation margin (VM) increase by approximately \$400 billion in March 2020 over its normalized level. Incremental IM is a net drain of liquidity from the markets into the CCPs, and while it is viewed as procyclical, these margin increases are deposited with the CCPs and reflect the elevated levels of market volatility. By contrast, while the aggregate VM increase was larger than the IM increase, that VM increase, in large part, is a redistribution of liquidity in the system from one counterparty to another.

In summary, approximately \$160 billion of IM increases drew short-term liquidity away from market participants. We view the inherent benefits of CCPs and lack of bilateral counterparty credit risk as positives, while acknowledging the potential concentration risk inherent in a small number of large CCPs.

Municipal Market. The municipal market has about \$149 billion in outstanding variable-rate demand obligations (VRDOs) and auction rate securities, which are primarily purchased by tax-exempt MMFs. Tax-exempt MMFs saw a net outflow of around \$9 billion in March (or about 7% of their net assets). Marketed to MMFs, VRDOs feature maturity-shortening provisions such as a demand option from a financial institution and often are backed by a letter of credit from a bank to enhance credit. Over the last ten years, banks, partly in response to the post-GFC capital and liquidity rules, have reduced their presence in the VRDO market and become direct lenders in the municipal market. In mid-March, liquidity pressures in the STFM led to a spike in short-term municipal rates, which led to increased borrowing costs for those municipalities. However, these spikes were short-lived, given the timely intervention by the Federal Reserve, and market participants do not point to any reported put-backs to bank balance sheets. However, this area of the STFM shows the interconnection between the municipalities, banks, and MMFs and the role adverse shocks can have on borrowing costs and credit availability on this segment of the market.

Lines of Credit. As of year-end 2019, revolving credit-line commitments extended to businesses by large banks reached \$3.6 trillion. In the first quarter of 2020, loans to corporations grew by \$470 billion, of which \$284 billion is attributable directly to revolver drawdowns. Though initially this short-dated funding demand did put some pressure on bank balance sheets, this abated quickly, in part because there were substantial inflows of \$560 billion into bank deposits over the same period, driven in large part by the increased demand for cash and near-cash assets.²³ Another \$1.6 trillion of deposits flowed into U.S. banks in the second quarter of 2020.

The banking system, through the provision of bank revolvers, serves as the fallback to stresses (and failures) in the STFM for access to near-term liquidity by corporates. In connection with the COVID-19 economic shock, the relative strength of the banking system supported the large inflow of deposits in March 2020 and in the following quarter. However, this area of contingent liquidity provision by banks remains an area where attention is warranted, because in future stress events, revolver and other short-term drawdowns may not be matched by large deposit inflows. Regulators and market participants should continue to monitor this key interconnection between the real economy (corporates), banks, and the STFM.

Regulatory Response

The Federal Reserve and the U.S. Treasury took steps to demonstrate commitment to improve and further support market functioning. These steps included open market operations; actions to improve liquidity conditions in the STFM; programs launched in coordination with the Treasury Department to facilitate the flow of credit to households, businesses, and state and local governments; and measures to encourage banks to use their substantial capital and liquidity buffers to support the economy during this time of hardship.²⁴ In addition, the Federal Reserve has also made a number of regulatory adjustments, which, among other things, were designed to promote market intermediating activity of securities dealers.²⁵

Of particular importance to the STFM were liquidity facilities that the Federal Reserve established to support directly the flow of credit to households and businesses. These facilities included the Primary Dealer Credit Facility (PDCF), the MMLF, and the Commercial Paper Funding Facility (CPFF). As the STFM recovered, usage of the liquidity facilities has declined.

For example, with respect to the MMLF, the maximum MMLF utilization reached \$51 billion in the first two weeks of April, or under 5% of the net assets in eligible MMFs. As of June 30, 2020, the total outstanding amount of MMLF loans was around \$21.4 billion. Initially, the MMLF was scheduled to stop providing new loans after September 30, 2020, but it was recently extended by three months through December 31, 2020.²⁶

4 STFM encompasses dealer repos; wholesale CDs; and securities issued with maturities of less than one year or with floating rates, including Treasury securities, GSE and government agency securities, CP, securities lending, prime brokerage, and lines of credit.

- 5 See Miller, R.S. (2020). COVID-19: Commercial Paper Market Strains and Federal Government Support (CRS Report No. IN11332). Retrieved from Congressional Research Service website: <https://crsreports.congress.gov/product/pdf/IN/IN11332>.
- 6 Financial Accounts of the United States: <https://www.federalreserve.gov/releases/z1/20200611/html/l207.htm>.
- 7 See the Federal Reserve Bank of New York, [list of primary dealers](#).
- 8 Form N-MFP data filed by MMFs are available to the public through the SEC's EDGAR database.
- 9 Financial Accounts of the United States.
- 10 Risk of asset "fire sales" manifested itself during the height of the 2008 GFC. Policymakers recognized that forced asset sales have the potential to amplify and transmit systemic risk. Some factors leading to forced sales have been addressed, albeit partially, through post-GFC regulations that encourage individual firms to reduce reliance on short-term repo funding.
- 11 See <https://libertystreeteconomics.newyorkfed.org/2020/05/treasury-market-liquidity-and-the-federal-reserve-during-the-covid-19-pandemic.html>.
- 12 See Marketwatch, "10-Year Treasury Yield Hits Three-Week High as Investors Rush to Raise Cash," March 18, 2020 (<https://www.marketwatch.com/story/treasurys-sell-off-as-investors-rush-to-raise-cash-2020-03-18>).
- 13 See Bloomberg, "How a Little Known Trade Upended the U.S. Treasury Market," March 17, 2020, (<https://www.bloomberg.com/news/articles/2020-03-17/treasury-futures-domino-that-helped-drive-fed-s-5-trillion-repo>).
- 14 http://www.mortgagenewsdaily.com/mortgage_rates/blog/942248.aspx.
- 15 RMA Securities Lending Survey
- 16 Typically, such funds are series under SEC registrants reporting that they are issuing a class of securities registered under the Securities Act of 1933 on Form N-CEN (Item B.7).
- 17 Source: iMoneyNet.
- 18 Source: Form N-MFP.
- 19 See Li, Lei, Yi Li, Marco Machiavelli, and Alex Xing Zhou (2020). "Runs and Interventions in the Time of COVID-19: Evidence from Money Funds," working paper, at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3607593.
- 20 Funds with WLAs below the 30 percent minimum threshold were *prohibited* from purchasing assets that were not WLA, including CP and NCDs with maturities exceeding 7 days.
- 21 Other Federal Reserve announcements around this time likely contributed to improvements in market conditions more broadly. For example, a large increase in open market purchases of Treasury securities and agency mortgage-backed securities was announced on March 15, and establishments of the PDCF and CPFF were announced on March 17.
- 22 Crane references in the following article: "July MFI: Fidelity Prime Inst Exit; T. Rowe's Lynagh; AFP Liquid Survey" published in July 8, 2020, an announcement from Fidelity in which Fidelity stated, "Our decision to liquidate these two funds was made after thoughtful review and consideration of our experience with investor behavior in institutional prime MMFs during periods of market stress, evolving institutional investor preferences, and our broader money market business. We are choosing to exit the institutional prime segment of the marketplace because we believe we can better meet institutional investors' needs with other cash management products."
- 23 Board of Governors of the Federal Reserve System (U.S.), Deposits, All Commercial Banks [DPSACBM027NBOG], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouis-fed.org/series/DPSACBM027NBOG>, August 19, 2020.
- 24 Chair Jerome H. Powell, *Coronavirus and CARES Act*, testimony before the Committee on Financial Services, U.S. House of Representatives, Washington, D.C., June 30, 2020.
- 25 See Board of Governors of the Federal Reserve System, *Supervisory and Regulatory Actions in Response to COVID-19*.
- 26 See the description of [Money Market Mutual Fund Liquidity Facility](#).

Chapter 3: Corporate Bond Market

Key Highlights

1. The U.S. corporate bond market is about \$9.1 trillion in size and approximately 67% of the U.S. corporate debt market. Ownership of corporate bonds is widely dispersed among insurance companies, RICs, pension funds, and foreign investors. Banks own only a small amount of corporate bonds, but they have material exposure through their investment banking, underwriting, and dealer activities in the corporate bond market.
2. Corporate debt levels have doubled since the 2008 GFC, but U.S. corporations' ability to service their debt has not changed significantly over the same period.
3. Corporate bonds have become increasingly concentrated in BBB-rated firms, increasing the risk of fallen angels, particularly in industries affected by the COVID-19 economic shock. Elevated credit spreads since the beginning of COVID-19 suggest that default risk remains higher.
4. Mutual funds and ETFs invest in corporate bond markets while providing daily liquidity to their shareholders. When shareholders redeem, funds might in turn sell bonds into the open market, which could lead to price declines in the underlying bonds.

Market Overview

Corporate debt markets are a key source of financing for U.S. corporations and a primary method by which investors finance real economic activity.²⁷ Corporations raise debt financing primarily by issuing bonds in the public capital market or by obtaining loans directly from banks and other financial institutions. Corporate debt provides an important link between financial markets and the real economy. As of 2020Q1, U.S. and foreign corporations had \$10.2 trillion of debt securities outstanding in the U.S. capital markets (\$9.1 trillion in bonds and \$1.1 trillion in CP) and about \$3.4 trillion of loans outstanding (See Figure 3.1). This chapter describes the corporate bond market and its interconnections with other parts of the U.S. capital markets, and explores the impact of the COVID-19 economic shock on that market and more broadly, including as a result of the interconnections.

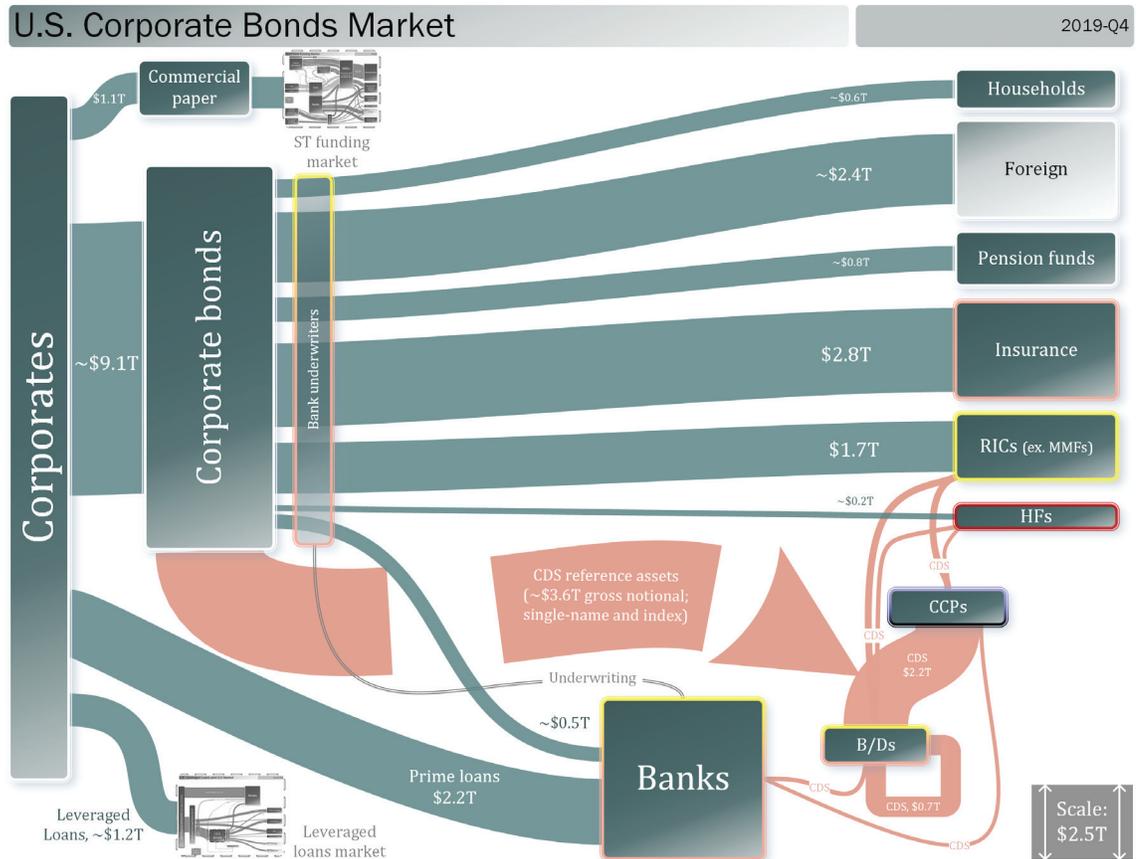
Market Structure

Ownership

Figure 3.1 illustrates the flow of corporate bonds from issuance to ownership through intermediaries. Nonbank institutions hold the majority of corporate bonds. Insurance companies, RICs, and pension funds own 31%, 19%, and 9% of outstanding bonds, respectively, and foreign investors account for a large share of ownership as well. While corporate bonds are a component of household investment portfolios, households typically invest in bonds through intermediaries, such as mutual funds and ETFs—direct holdings by households are relatively small. Banks hold a relatively small share of the ownership distribution. Despite banks' limited direct ownership,

they still have material exposure to corporate debt securities, and corporate credit more generally, through their investment banking, underwriting, and dealer activities in the corporate bond market. Banks participate in the STFM, provide revolving loans to corporations, and are dealers in credit default swap (CDS) markets (the principal markets for hedging corporate debt exposure).

Figure 3.1. Corporate Bond Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$2.5 trillion shown at bottom right for scale). Data sources and other technical details are in the Appendix.

Issuance

Unlike the limited number of issuers of government-backed bonds and securities, such as Treasury debt or agency MBS, the corporate bond market is notable for large numbers of issues and issuers. Currently over 2,500 different nonfinancial corporations have close to 10,000 bonds outstanding. The median issue is \$500 million, but a few have a large amount outstanding—e.g., the largest issue has \$9.5 billion outstanding.²⁸ With the large dispersion in size, typically only the largest bonds trade regularly. Even the bonds that are largest in outstanding size and most traded do not match the liquidity and relatively narrow bid-ask spreads of agency MBS, Treasuries, or, as an alternative point of comparison, large corporate equity listings.

Trading

Since January 2006, the overall turnover of IG corporate bonds relative to market size has declined from 103% to 70% as aggregate trading volumes have not kept pace with the growing dollar amount outstanding.²⁹ Furthermore, this decline is more pronounced among bonds outside the 100 largest bond issuances. Several reasons account for this phenomenon. First, before the 2008 GFC, the chief intermediaries in the corporate bond market were dealers, typically affiliated with banks. These dealers held corporate bonds in inventory and acted as liquidity-providing market makers, i.e., a “principal-at-risk” business model. Following the 2008 GFC, dealers moved toward an agency model, helping to match buyers and sellers. However, they no longer commit a large portion of their balance sheet to holding inventory, which has reduced their liquidity provision. Relatedly, banks no longer engage in proprietary trading and have sized their market-making activities to meet regulatory constraints and anticipated market demand while seeking to maximize the return on capital allocated to such activities. As a result, dealer balance sheets have declined from approximately \$225 billion around the time of the 2008 GFC to about \$50 billion today and generally are focused on more liquid aspects of the market.³⁰

Second, the corporate bond market growth has further accelerated the CUSIP proliferation and the dispersion of liquidity. Since March 2012, the number of traded HY nonfinancial corporate bond CUSIPs has remained steady at approximately 2,500 CUSIPs, but the number of traded IG nonfinancial corporate bond CUSIPs has steadily grown from 3,842 to 6,623.³¹ These changes have been balanced somewhat by a push toward electronic trading—which likely improves liquidity by facilitating transparency. Research from Greenwich Associates indicates that at the end of 2019, approximately 34% of IG bonds traded electronically.³²

At the same time, the corporate bond ETF market has grown substantially. Just prior to the 2008 GFC, in the first quarter of 2008, total net assets for IG and HY corporate bond ETFs were \$3.7 billion and \$0.6 billion, respectively. Since then, these two markets have grown at average quarterly growth rates of 8.2% and 11.9%, respectively, and total net assets now stand at \$117.5 billion for IG ETFs and \$66.4 billion for HY ETFs.³³

The combination of these two features, decreased turnover in the bond market and rapid growth in the ETF market, suggest that trading in corporate debt is migrating from the cash market to ETFs. While the size of the corporate bond ETF market is still a small fraction of the overall bond market, this migration is likely to continue, as ETFs provide a low-cost means to obtain diversified exposure to corporate credit. In addition, because bond ETFs trade on exchanges and are generally more liquid than the cash bond market, bond ETFs are viewed by a number of market participants as playing an increasingly important role in price discovery. These liquidity and potential price discovery characteristics were evident in March 2020 when the information environment was changing rapidly and volatility and stress more generally were high. During that period, ETFs generally functioned as expected, allowing investors to transfer diversified bond risk on the secondary market without transacting directly in the underlying bonds. ETFs transact directly with authorized participants in cash, in-kind, or some combination. ETFs transacting in cash only could face the challenge of potential mismatches in requests for redemptions or purchases in the presence of a relatively illiquid cash bond market.³⁴

Interconnectedness

The corporate bond market is connected to the STFM, derivatives markets, and the real economy. In contrast to certain other fixed-income securities, such as Treasuries and agency MBS, corporate bonds serve infrequently as collateral in the STFM. The limited amount of corporate bond-based lending activity is more related to transaction facilitation than operational funding and includes primary dealers who do post and accept corporate bonds as collateral in these transactions. Mutual funds and other institutions also lend corporate bonds as part of securities lending agreements and hedge funds borrow them in their prime brokerage margin accounts to facilitate short positioning.

The connection to the derivatives market is through CDS, where corporate bonds are the underlying or “reference” assets. As of year-end 2019, the notional amount outstanding of single-name and index CDS was approximately \$3.6 trillion. Of this amount, a small number of over-the-counter (OTC) derivative dealers held approximately \$1.0 trillion, with an additional \$1.8 trillion cleared by central counterparties (CCPs).³⁵ Unlike the underlying corporate bond cash market, where ownership and issuance are widely dispersed, holdings in the CDS market are concentrated among certain larger participants in the global financial system. Because of the limited liquidity in the bond cash market discussed earlier, investors often find the CDS market a more cost-efficient way to obtain and adjust their exposure to credit risk. As a result, during the high volatility months of March–April 2020, the gross notional value of the single-name CDS market in the United States temporarily increased. This market grew from \$2.8 trillion at the end of 2019 to a yearly high of \$3 trillion in early May before returning to its initial level.³⁶

In addition, and significantly, corporate bonds provide an important link between financial markets and the real economy. However, because corporate bonds generally have fixed interest rates (and, therefore, payments), they magnify the issuers’ exposure to shifts in the real economy. For example, during a recession, when revenues are reduced, a more levered issuer’s income would be expected to fall more than a similar, but less levered issuer. In addition, in a recessionary environment, corporations and individuals might take steps to preserve cash, including selling higher risk assets. Collective selling by investors can lead to downward price pressure in asset markets, which can worsen the recession’s negative impact on the financial sector’s aggregate capitalization. In addition, defaults by corporations can trigger event-specific payments on derivative contracts. The direction of transmission can run the other way as well, from the financial system to the real economy. As we witnessed in the 2008 GFC, an adverse financial shock can cause the aggregate capitalization of the financial sector to deteriorate, impairing the sector’s ability to extend credit to the real economy. For example, the STFM facilitates a great deal of day-to-day economic activity, so any significant disruption in the availability of credit from the financial sector can adversely affect real economic activity.

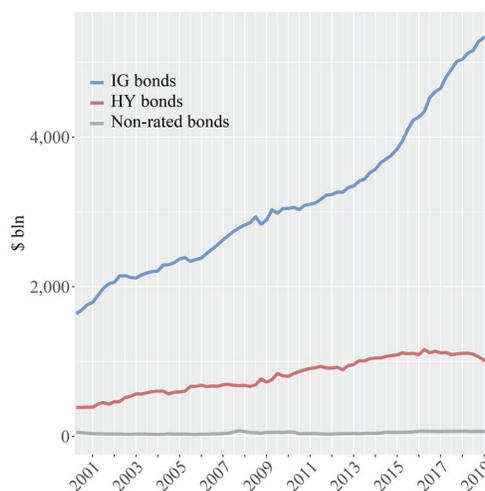
Downgrades, Defaults, and Market Structure

Negative general and sector-specific economic shocks that weaken issuers' financial strength can generate credit downgrades, bond defaults, and bankruptcies. The effect of a negative economic shock on the bond market depends on various factors, including the risk profile of the bond market, the overall indebtedness of the corporate sector, and the structure of the bond market.

Negative economic shocks are a greater risk to corporate issuers with low credit quality. While IG bonds are more prevalent than ever before (See Figure 3.2), IG bonds' average credit rating has declined over the last two decades. In 2000, fewer than 30% of IG bonds were BBB-rated, while today BBB rated issuances constitute nearly 45% of IG bonds. Similarly, the share of bonds rated BBB- (the lowest IG rating) increased from 8% to 12% over the same period.³⁷ Adverse economic conditions could lead to the downgrading of many IG firms to HY status, thus turning them into fallen angels. This not only raises their funding costs, but such firms could also lose access to certain institutions as lenders and holders of their debt. For example, insurance companies are important investors in corporate bonds, but they are relatively ratings-sensitive because their capital requirements rise as their investment portfolio moves down the ratings spectrum. In particular, insurance companies might be reluctant to buy additional issues of the fallen angels and they might divest their holdings of fallen angels, though they have flexibility in deciding when to divest.³⁸ Pension funds are another class of institution that may be subject to fund-specific investment mandates that prohibit or discourage investment in HY securities. However, pension funds, too, have flexibility in timing their divestment of fallen angels.

Recently, observers have raised concerns that credit rating downgrades—in particular, downgrades from IG to HY—may be procyclical.³⁹ Specifically, downgrades tend to occur in times of stress during which firms perform poorly. These downgrades signal elevated default risk and raise the firms' cost of capital, which in turn contributes to further poor financial performance and further ratings downgrades. If ratings downgrades induce investors to sell bonds at the same time, the sellers might find it challenging to liquidate their bonds at acceptable prices. Selling triggered by downgrades may further lower prices in an already-depressed market. However, a countervailing force is that investors may find the bond market to be overly depressed and present an attractive buying opportunity. In addition, rating agency actions are typically a lagging indicator of the cost of debt capital (i.e., bond prices decrease in advance of ratings actions). While credit ratings can and do inform investors about the risks of a particular issue, investors form their own assessments about credit risk from a variety of information sources. In many cases, credit ratings affirm the market's

Figure 3.2. Bonds Outstanding by Rating Category



Source: Mergent FISD

assessment of credit risk and the cost of capital. Indeed, credit spreads typically widen before downgrades, implying that the market anticipates downgrades.⁴⁰ This dynamic is consistent with observed market activity in the early stages of the COVID-19 economic shock. Credit spreads began increasing in early March 2020 during the global economic slowdown, in anticipation of ratings downgrades by the credit rating agencies.

Another potential risk in the corporate bond market is the overall indebtedness of nonfinancial corporate issuers. This amount has grown substantially in the 12 years since the 2008 GFC (See Figure 3.2).⁴¹ From 2008 to 2019, aggregate corporate bonds outstanding increased from about \$3.6 trillion to around \$6.5 trillion. Several factors may have contributed to this growth, including the combination of accommodative monetary policy and increased demand for savings, which led to favorable (lower) interest rates for borrowers over the past decade. The resulting lower interest expense, as well as higher equity valuations, in turn, increased many corporate borrowers' debt capacity. Finally, the sustained period of low interest rates may have driven certain types of investors to "reach for yield," enabling corporate borrowers, particularly low IG borrowers, to issue large amounts of debt under attractive terms during the stable economic conditions prior to the onset of the COVID-19 economic shock in March 2020.

Despite the decline in average credit ratings and the growth of corporate debt, widely-accepted indicators of debt capacity suggest that U.S. corporations' ability to service their debt has not deteriorated in the last decade. For example, the interest coverage ratio, which measures how many times a corporate issuer can cover its interest payment with available earnings, has not changed significantly since 2005 for any rating category and has slightly increased for most rating categories since 2010.⁴² This consistency in the coverage ratio, at the same time outstanding debt has increased, reflects the effects of lower interest expenses. In addition, high stock market valuations have resulted in relatively low market-valued leverage ratios (debt-to-total market value) by historical standards. U.S. public firms' aggregate market leverage was 34% in 1982, 28% in 2008, and 24% in 2019.⁴³ However, market leverage rose markedly in 2019 for BBB-rated and HY corporate issuers and in 2020 for issuers across both IG and HY rating categories.⁴⁴

Potential stress in the corporate bond market can arise as a result of structural characteristics. For example, as discussed earlier, dealer inventories have declined since the 2008 GFC with the shift from a risk-taking to a market-making-based dealer model. Small dealer inventories and capital availability can make it difficult to facilitate trading when a significant market event occurs and a large number of market participants seek to adjust their holdings. The consequences of this shift in dealer structure may have been on display during the early stages of the COVID-19 economic shock, when dealer inventories fell, bid-ask spreads widened markedly, and dealers had limited capacity to take on more inventory.

The relative illiquidity of corporate bonds can pose risks for pooled investment vehicles (e.g., mutual funds). For example, infrequent trading of many individual bonds can at times create challenges for funds that need accurate market prices to calculate a daily NAV to apply in purchases, exchanges, and redemptions.

Impact of the COVID-19 Economic Shock

During the market stress related to the COVID-19 economic shock, corporate bond trading volume spiked, trading costs increased dramatically, and credit spreads widened. Compared to the preceding two years, the average daily trading volumes for corporate bonds in March and April 2020 increased by approximately 48% and remained elevated through May⁴⁵ before returning to typical levels in June and July. Some of this increase may have been due to the Federal Reserve's actions to relax balance sheet constraints for primary dealers both directly and indirectly, including through the Primary Dealer Credit Facility.

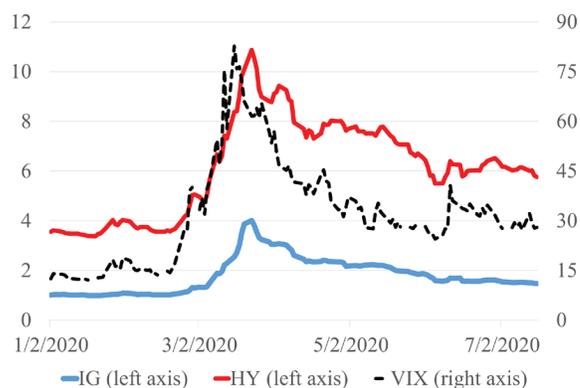
Transaction costs, as measured by effective bid-ask spreads, spiked to historically high levels in March 2020. Recent research by staff at the Federal Reserve Bank of New York⁴⁶ shows that bid-ask spreads spiked by as much as 100 basis points for HY bonds and 150–200 basis points for IG bonds in March. In particular, the first two months of 2020 were a period of stability in the bond market, with bid-ask spreads holding steady at around 10–20 basis points for IG and 25 basis points for HY. In early March, spreads rose rapidly, peaking in mid-March at nearly 125 basis points for HY, and between 175 and 200 basis points for IG, before declining rapidly after the announcement of the Federal Reserve's corporate credit facilities. By April, spreads had stabilized, though they remained mildly elevated relative to the period before the COVID-19 economic shock.

A number of factors impact bid-ask spreads, including liquidity, uncertainty, and asymmetric information, as well as the willingness of dealers to absorb inventory.⁴⁷ All these factors appeared to be present in March 2020, though it is difficult to determine precisely how much any one factor (or combination of factors) contributed to the behavior of spreads. Recent research from the Federal Reserve Bank of Philadelphia⁴⁸ focuses on the inventory held by dealers. In particular, the authors estimate that dealer inventories began declining in early March, precisely at the same time that bid-ask spreads began rising. Furthermore, dealers only began accommodating customer demand again (by absorbing more inventory) after the Federal Reserve provided certain capital relief to regulated banks and introduced the Primary and Secondary Market Corporate Credit Facilities later in the month.

Credit spreads exhibited similar behavior, remaining stable for much of the first quarter of 2020 at around 100 basis points for IG bonds and 350 basis points for HY bonds, and then rising rapidly in mid-March. Spreads peaked on March 23, 2020⁴⁹ at 401 basis points for IG and 1087 basis points for HY bonds (See Figure 3.3). This figure also shows that the behavior of corporate credit spreads closely matched the behavior of the VIX. Credit spreads have declined since March, but they remain elevated compared to the period before the COVID-19 economic shock, signaling that default risk and market-wide uncertainty remain elevated.

Finally, though many observers have been concerned about bond funds' ability to meet redemption requests during periods of market stress,⁵⁰ these concerns did not materialize during the period of market turmoil in March. Commission staff estimate that bond mutual funds experienced \$255 billion of net outflows during March 2020, with another \$21 billion from bond ETFs. However, total trading volume in the corporate bond market during the same period was more than triple the level of bond fund outflows, totaling \$1.08 trillion in March 2020, or \$49.2 billion per day.⁵¹

Figure 3.3. Corporate Credit Spreads and VIX



Sources: ICE Data Indices, LLC, and Chicago Board Options Exchange

Several bond ETFs traded at significant discounts to net asset value (NAV).⁵² This difference between an ETF's market price and its NAV can occur due to a variety of reasons, including when illiquidity in the cash bond market makes it challenging for authorized participants to engage in the arbitrage transactions that would generally operate to reduce the difference between the market price and NAV of the ETF. While in certain market conditions departures from NAV are considered to be indications of inefficiency in fund pricing, this is not necessarily the case in all circumstances. ETFs are available for trading continuously on exchange throughout the trading day and are relatively more liquid than the underlying cash bonds in which they invest. Thus, ETF market prices can rapidly incorporate new information as it becomes available. In contrast, most bonds trade only infrequently, and as a result, bond prices may be relatively insensitive to the arrival of new information. Bond funds, including bond ETFs, generally calculate their NAV in reliance on evaluated prices, matrix prices, price opinions, or similar pricing estimates. During periods of market volatility when the information environment is changing rapidly—as was the case during in March 2020—ETF market prices are viewed by some market participants as a more reliable indicator of actionable value than the ETF's NAV.

While bond trading generally has stabilized, the COVID-19 economic shock might continue to stress the corporate bond market through its effect on the financial health of issuers. If COVID-19 increases the incidence of corporate bond defaults and corporate restructurings, investors will incur credit losses. Losses currently are running higher than in 2019. For example, in the HY universe, there have been 59 defaults, which makes the speculative-grade corporate default rate 4.1% in 2020⁵³ compared to about 2% in 2019.⁵⁴ As for the outlook for 2021, 112–289 defaults (6%–15% default rate) are forecast from the extant cohort of outstanding HY bonds.⁵⁵ In addition, 24 firms have been downgraded to fallen angel status (i.e., BBB- or lower rating) so far in 2020, adding about \$300 billion to the HY universe of bonds, and S&P's list of potential fallen angels is now at a historically high 120 issuers.⁵⁶

In summary, while trading in the corporate bond market was significantly elevated in March and April of 2020, trading costs and credit spreads reached peak levels. The increases in spreads were likely driven by a combination of (i) structural issues in the market—in particular, fragmented liquidity in the cash market and reduced dealer inventories—and (ii) elevated economic uncertainty. The Federal Reserve’s regulatory actions and the corporate credit facilities helped stabilize this market and the credit spreads narrowed, but they remain wider than before the COVID-19 economic shock, which suggests corporate default risk continues to be high and could lead to significant losses for bond investors depending on the shape of the COVID-19–related stress in the future.

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- 27 The other primary method is equity financing. According to the World Federation of Exchanges, U.S. domestic stock market capitalization (NYSE + NASDAQ) was \$35.6 trillion as of July 2020.
- 28 Source: Mergent FISD.
- 29 Source: MarketAxess, available at <https://www.marketaxess.com/inform/research/market-insights/3>. Turnover is calculated on a trailing 12 month basis. Over the same period, turnover for the top 1000 CUSIPs by volume declined from 184.97% in January 2006 to 156.61% in February 2020. However, since February, turnover has steadily climbed each month and stood at 182.77% in July 2020.
- 30 Source: Federal Reserve Bank of New York.
- 31 DERA staff calculation based on TRACE trade reporting data; the specific values for HY CUSIPs are 2,316 in March 2012 and 2,857 in August 2020.
- 32 <https://www.wsj.com/articles/electronic-trading-surges-to-34-of-corporate-bond-market-11579010400>.
- 33 Source: Morningstar.
- 34 ETFs must own the underlying cash bonds and the function of net unit creation has to match the net buying or selling of the underlying cash corporate bond portfolio.
- 35 See BIS, Semi-annual OTC derivatives statistics at December 2019, Table 10.1, available at: <https://stats.bis.org/statx/srs/table/d10.1?f=pdf>. During the same period, total notional outstanding for multi-name CDS was \$4.1 trillion, of which index CDS accounted for \$3.8 trillion.
- 36 DTCC-TIW regulatory data.
- 37 Staff calculations; Data source: Mergent FISD.
- 38 See, e.g., the National Association of Insurance Commissioners Issue Brief on “Regulatory Reliance on Credit Ratings,” available at: https://www.naic.org/documents/topics_regulatory_reliance_credit_ratings_brief.pdf. The Issue Brief notes that while the NAIC and state insurance regulators have moved away from credit ratings for MBS, they continue to rely on credit ratings from NRSROs for other fixed-income asset classes.
- 39 See, e.g., European Systemic Risk Board, “Issues note on liquidity in the corporate bond and CP markets, the procyclical impact of downgrades and implications for asset managers and insurers” (undated), available at https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200514_issues_note-ff7df26b93.en.pdf.
- 40 See, e.g., Morgan Stanley, Corporate Credit Research – North America, “The Nature of the BBBeast” (October 5, 2018), available at <https://www.sec.gov/spotlight/fixed-income-advisory-committee/morgan-stanley-nature-of-the-bbbeast.pdf>, noting, among other things, that downgrades tend to lag the market.

- 41 This growth is a continuation of a broader trend that has been occurring for several decades. From the first quarter of 1952 to the first quarter of 2002, the average growth rate of corporate debt outstanding was 1.9% per quarter. This implies that the level of debt doubled roughly every 9 years on average. While the growth in corporate debt since the 2008 GFC is remarkable in absolute terms, the rate of growth has slowed in recent years relative to the historical average. Source: Board of Governors of the Federal Reserve System (U.S.), Nonfinancial Corporate Businesses; Debt Securities; Liability, Level [NCBDBIQ027S], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/NCBDBIQ027S>, July 12, 2020.
- 42 Interest coverage ratios stand at approximately 2.5 for HY bonds, 6.5 for BBB-rated bonds, and 11.5 for AAA/AA/A-rated bonds. Source: Compustat, Thomson Reuters DataScope, and Mergent FISD.
- 43 Compustat Daily Updates - Fundamentals Annual. (2020, August 17). [Total debt, shares outstanding, and closing fiscal-year share price for all U.S. firms, 1980 - 2019]. <https://wrds-web.wharton.upenn.edu/wrds/>.
- 44 Source: Capital IQ.
- 45 See FINRA TRACE Monthly Volume Reports, available at <https://www.finra.org/filing-reporting/trace/content-licensing/monthly-volume-report/2020>. For the 2-year period from March 2018 through February 2020, dollar trading volume averaged \$33.175 billion per day. In March and April of 2020, dollar trading volume averaged \$49.139 billion per day. This increase in March and April does not appear to be seasonal, as trading volumes in March and April were 29% and 39% higher than they had been in March and April of 2019.
- 46 Boyarchenko, Kovner, and Shachar, "It's What You Say and What You Buy: A Holistic Evaluation of the Corporate Credit Facilities." Federal Reserve Bank of New York Staff Report No. 935, July 2020. See Figure 1.
- 47 Feldhutter, Peter and Thomas Kjaer Poulsen, "What Determines Bid-Ask Spreads in Over-the-Counter Markets?" November 18, 2018, available at SSRN: <https://ssrn.com/abstract=3286557>.
- 48 Kargar, Mahyar, Benjamin Lester, David Lindsay, Shuo Liu, Pierre-Olivier Weill, and Diego Zuniga, "Corporate Bond Liquidity During the COVID-19 Crisis." Federal Reserve Bank of Philadelphia Research Brief, April 2020.
- 49 March 23, 2020 is the date the Federal Reserve announced the creation of the Primary Market Corporate Credit Facility.
- 50 See, e.g., Morningstar, "How Short-Term Bond Funds Went Wrong (Again)," July 1, 2020, available at <https://www.morningstar.com/articles/989526/how-short-term-bond-funds-went-wrong-again>.
- 51 Source: FINRA public reporting, Commission staff calculations.
- 52 See, e.g., Lim, Dawn, "Bond ETFs Flash Warning Signs of Growing Mismatch." Wall Street Journal, 23 March 2020, available at <https://www.wsj.com/articles/bond-etfs-flash-warning-signs-of-growing-mismatch-11584964801>.
- 53 S&P Global, "S&P raises US speculative-grade default rate forecast to 12.5%," May 28, 2020.
- 54 S&P Global, "Default, Transition, and Recovery: The U.S. Speculative-Grade Corporate Default Rate Is Likely To Reach 12.5% By March 2021," May 28, 2020.
- 55 S&P Global, "Default, Transition, and Recovery: The U.S. Speculative-Grade Corporate Default Rate Is Likely To Reach 12.5% By March 2021," May 28, 2020.
- 56 S&P Global, "Credit Trends: 'BBB' Pulse: The Potential Fallen Angels Total Starts To Decline From Record Highs," August 26, 2020.

Chapter 4: Institutional Leveraged Loan and CLO Markets

Key Highlights

1. Following rapid growth since 2012, \$1.2 trillion of syndicated leveraged loans are currently outstanding in the United States, and CLOs account for about half of those loans. Debt held in CLOs is approximately 5% of the overall corporate credit market and approximately 22% of the HY market.
2. As the market for leveraged loans has expanded, increasingly higher risk loans have entered CLO pools: the average credit rating of loans has steadily declined, and more than 85% of loans are now “cov-lite.”
3. While CLOs have weathered the storm well so far, future leveraged loan defaults or downgrades could result in investor losses.
4. The COVID-19 economic shock has put certain leveraged loan borrowers under stress, and defaults are increasing in several sectors.
5. Absent high portfolio loan default rates, AAA CLO tranches are unlikely to suffer losses.
6. A diverse set of investors and numerous intermediaries are active in the CLO market, limiting risk of a market disruption.

Market Overview

“Leveraged loans,” as used here, refer to syndicated loans to highly levered or non-investment grade firms held by institutional investors. Approximately \$1.2 trillion of leveraged loans are currently outstanding in the United States. This market has seen robust growth, doubling since 2013.

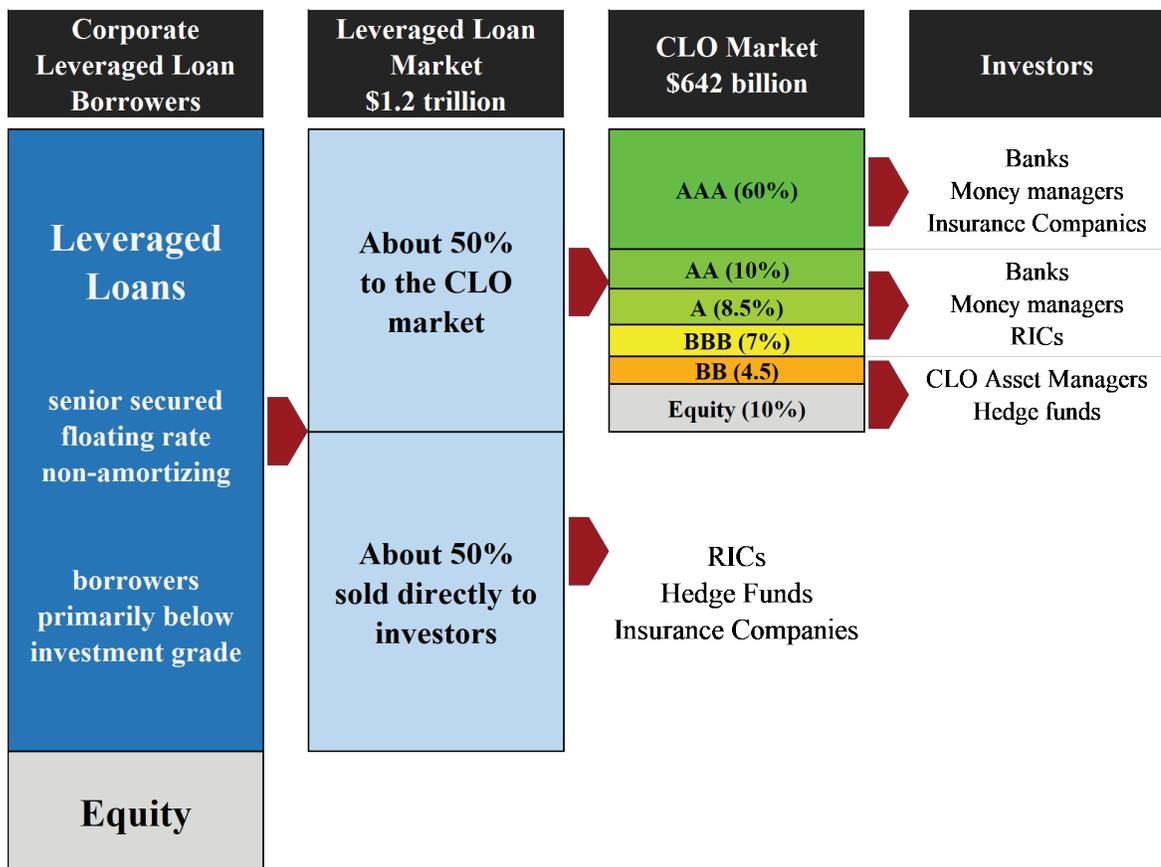
CLOs are structured investment vehicles that hold pools of leveraged loans. CLOs issue asset-backed securities to finance their loan portfolios. They are an important part of the leveraged loan market, holding roughly half of all leveraged loans outstanding.

Market Structure

A leveraged loan is typically part of a broader bank-arranged financing package that includes various revolving credit and term loan facilities. A leveraged loan syndication generally involves many institutional investors. Typically, leveraged loans comprise non-amortizing, floating rate facilities with senior secured claims to the borrower’s assets. They generally include a number of “incurrence covenants” that restrict the borrower from taking actions detrimental to the lenders, although increasingly they lack maintenance covenants that trigger a default if the borrower’s financial condition deteriorates.

CLOs are special purpose entities that acquire a portfolio of loans and issue securities (“notes”) in groups, or tranches, of varying seniority and risk exposure (See Figure 4.1). The most senior, or AAA, tranche accounts for about 60%–65% of the capital structure. Below the AAA tranche, many junior or “mezzanine” tranches account for about 25%–30%, and the remainder is made up of equity claims. Junior tranches provide credit support to the senior tranches and payments to junior tranches are conditional on the satisfaction of various performance tests. The precise rules governing the flow of payments, known as the “waterfall,” are set forth in the CLO indenture. CLO managers typically retain a residual interest through subordinated fees and/or equity interests and are responsible for actively managing the CLO’s loan portfolio.

Figure 4.1. Illustrative CLO Capital Structure

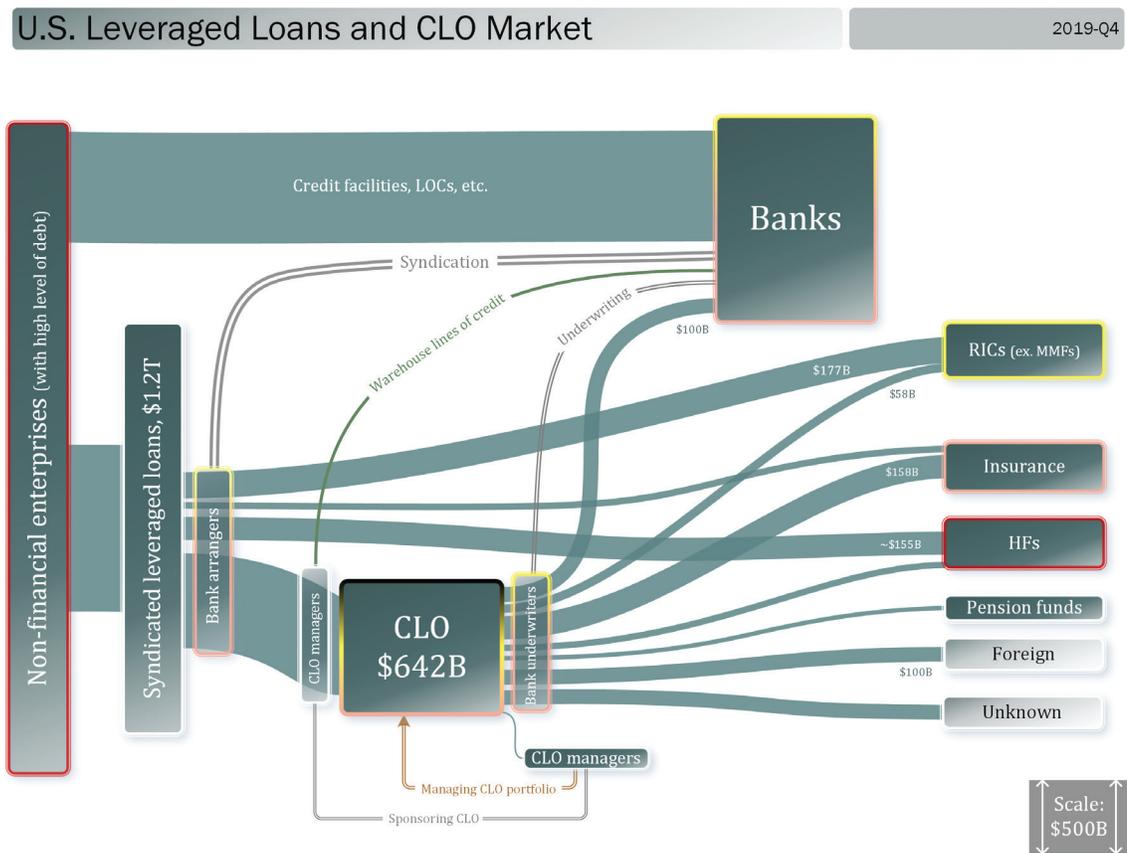


Several structural and market features limit the risks to investors in CLO securities. First, CLOs almost always hold pools of senior secured loans diversified across industries. Diversification reduces the risk of correlated defaults across underlying securities while the senior secured position limits losses in the event of a default on a specific underlying security. Second, CLO assets and liabilities have similar maturity, both have floating rates, and the liabilities are not redeemable. These features limit the exposure of CLOs to interest rate risk and run risk. Third,

CLOs are subject to monthly cash flow and collateral tests. These tests protect senior note holders by restricting distributions to junior note holders when portfolio values or cash flows fall below preset thresholds. Importantly, performance tests in so-called 2.0 CLOs (i.e., CLOs issued after the 2008 GFC) are not based on marked-to-market loan values, which helps limit “forced selling” by CLOs during periods of price volatility. These features effectively concentrate the risks of portfolio deterioration with the junior note holders and the equity tranches during times of stress.

A variety of institutions invest in CLO debt. Major CLO debt holders include domestic banks and insurance companies (holding 16% and 25% of CLO issuance) as well as RICs (9%). Hedge funds, pension funds, and foreign investors hold the bulk of the remaining CLO debt securities. Investors in CLO equity tranches are primarily CLO asset managers, pension funds, and other private funds including hedge funds.

Figure 4.2. Institutional Leveraged Loan and CLO Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$500 billion shown at bottom right for scale). Data sources and other technical details are in the Appendix.

Interconnectedness

Leveraged loans account for a relatively small portion of total debt outstanding in U.S. markets. Nonetheless, leveraged loan and CLO markets create connections across a wide range of participants in U.S. capital markets (See Figure 4.2). They expose levered lenders like banks and insurance companies to higher risk borrowers (e.g., leveraged buyouts). Thus, despite their small size, investors in these markets can potentially incur material losses.

CLOs hold about half of the \$1.2 trillion in leveraged loans outstanding. RICs and private funds hold the bulk of the remainder, each accounting for approximately 15% of the leveraged loans outstanding.

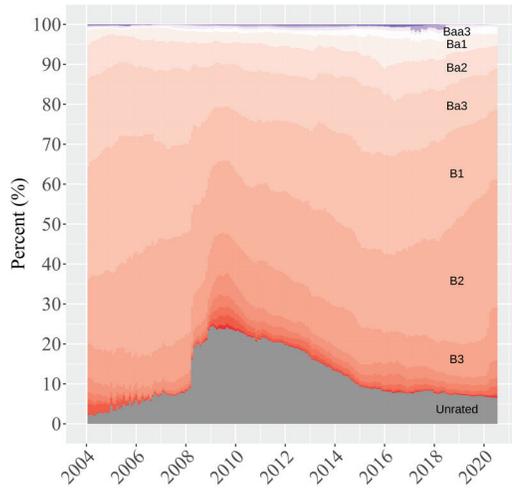
A wide range of institutional investors own CLO securities. Insurance companies, U.S. bank holding companies, and RICs respectively hold 25%, 16%, and 9% of CLOs outstanding, and they collectively account for approximately half of the total. These entities typically hold high-rated CLO tranches. Private funds, pension funds, and CLO sponsors hold the other, lower rated tranches and the equity layer. As a result, they bear the first-loss credit risk exposure and most of the expected credit losses related to CLOs.

Banks play a critical role in the functioning of the leveraged loan and CLO markets: by extending revolving lines of credit to leveraged borrowers, by originating most leveraged loans, by providing warehouse lines of credit to CLO sponsors, and by underwriting CLO issuance. Banks also hold leveraged loans and CLO securities on their balance sheets. Market participants in the leveraged loan and CLO markets depend on banks' credit provision to keep these markets functioning smoothly.

Market Dynamics and Stresses

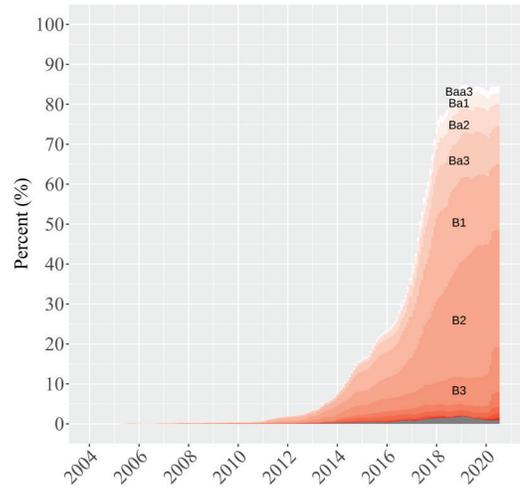
The fundamental risk in the leveraged loan and CLO markets is the financial health of leveraged borrowers, i.e., their credit risk. The low interest rate environment of 2014–2018 and the resulting incentives to “reach for yield” can help explain the growth in leveraged lending and increasing credit risk of leveraged borrowers. This is reflected in the declining credit ratings of loans in CLO portfolios: the share of loans rated B2 or lower (equivalently, B or lower on the S&P scale) has risen from 40% in 2016 to 60% at the end of 2019 (See Figure 4.3a). The leveraged loan market has become more issuer friendly during this period, as illustrated by the growing dominance of leveraged loans that are cov-lite. Today, such loans account for nearly 85% of U.S. CLO portfolios (See Figure 4.3b). The increased presence of “cov-lite” loans could reduce the recoveries of holders of leveraged loans, both in absolute terms and relative to other creditors, in the event of a default.

Figure 4.3a. CLO Holdings by Credit Rating



Source: Moody's

Figure 4.3b. Cov-Lite CLO Holdings



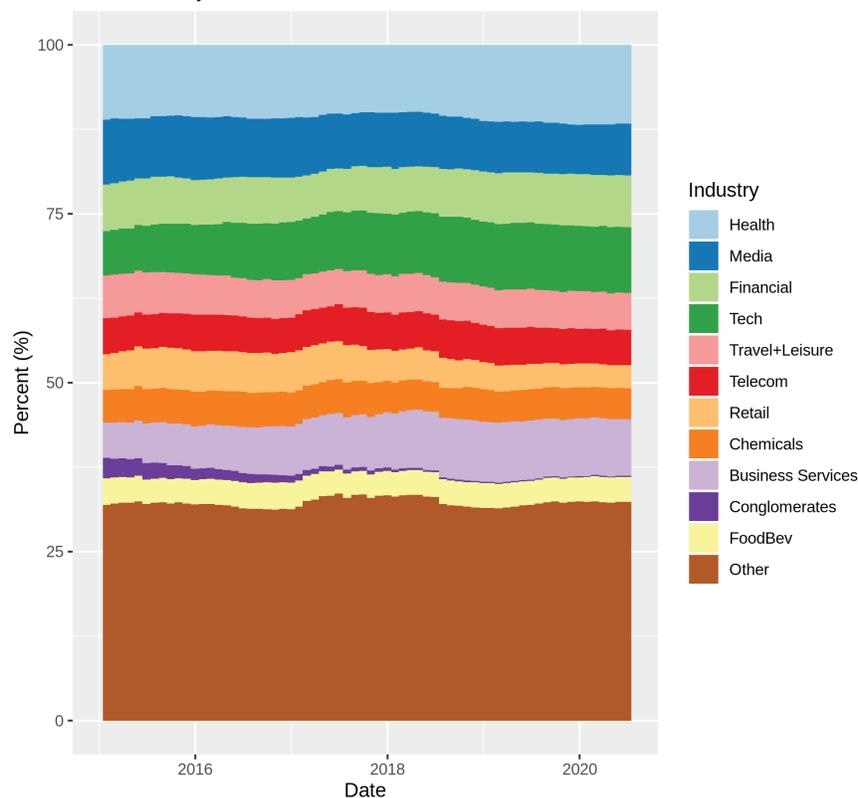
Source: Moody's

Beyond the credit risk of individual leveraged-loan borrowers, default correlations are a critical factor in the performance—and ratings—of senior CLO securities. To minimize default correlations and limit their “concentration risk,” CLOs aim to diversify across borrowers (with 350 issuers in the typical portfolio) and industries (See Figure 4.4). This, together with the substantial credit enhancement provided by junior CLO tranches, helps to ensure that senior CLO tranches are low risk. However, if default expectations become highly correlated (because of a common economic shock that affects a large number of borrowers), the probability of senior CLO tranches incurring losses would increase, undermining such perceptions.

Figure 4.4. Industry Breakdown of Aggregate CLO Loan Holdings

Industry breakdown of CLOs' loan holdings.

Source: Moody's



Source: Moody's.

The prospect of a deterioration in the risk profile of AAA CLO tranches is worthy of examination primarily because it could cause a large class of investors (e.g., investors who must hold mostly low-risk assets) to exit a market that ordinarily has low trading volumes and idiosyncratic tranches. Such a shift could not only disrupt the CLO market but also adversely affect the functioning of the broader leveraged loan market. However, as discussed above, certain features of the CLO market help mitigate the concern. CLOs do not promise immediate liquidity but promise a cash flow waterfall to investors; thus, they are not held as liquid assets. Many types of institutional investors hold CLOs (See Figure 4.2), reducing the risk of broad forced selling. Finally, because numerous syndicating banks and dealers are active in the CLO market, the risk of market disruption due to the exit of a single intermediary is limited.

Impact of the COVID-19 Economic Shock

The CLO market has more than doubled since 2012, from \$250 billion to \$642 billion. CLO issuance in the United States was at an all-time high before the COVID-19 economic shock (See Figure 4.5a). After a 3-month hiatus, CLO issuances have rebounded to almost pre-outbreak levels (See Figure 4.5b). This short disruption to issuance did not materially affect the amount of CLO securities outstanding, which remains more than double the peak reached prior to the 2008 GFC (See Figure 4.5c).

Figure 4.5a. Annual CLO Issuance, 2000-2020

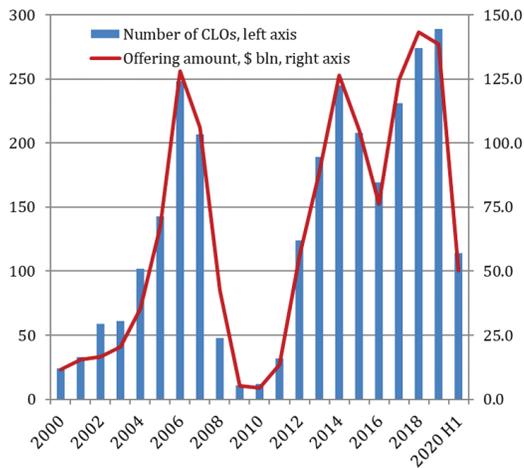


Figure 4.5b. Monthly CLO Issuance, Jan 2019 to July 2020

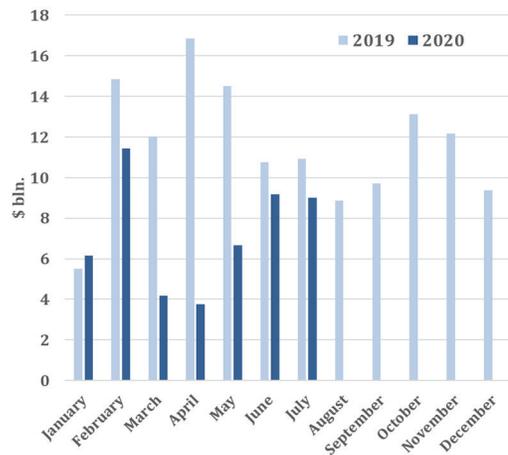
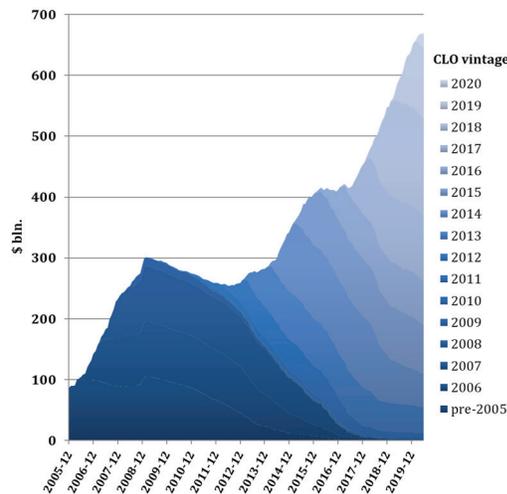


Figure 4.5c. CLOs Outstanding, 2005-2019

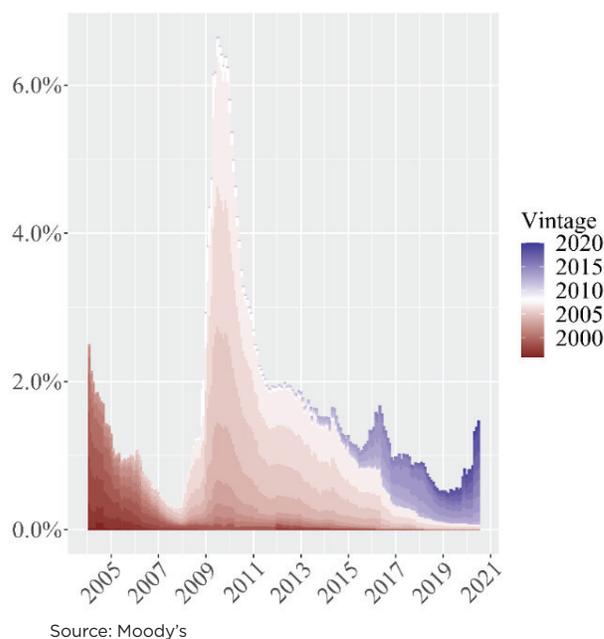


Sources (all panels): Moody's and AB Alert

The onset of the COVID-19 economic shock and its widespread impact on a large number of borrowers had a pronounced effect on the leveraged loan market: loans trading at 98 in February were trading below 80 in March. Despite this precipitous initial decline, the market has since stabilized.⁵⁷ Currently, leveraged loans trade at a discount of approximately 6 points to par (i.e., at 94), suggesting default expectations are roughly double pre-COVID-19 levels, but well above the lows seen in March. Credit ratings reflect the heightened default expectations: Figure 4.3a shows that the share of lower rated loans in CLO portfolios increased sharply in 2020. Loans rated B3 or lower now account for about 30% of CLO holdings. Defaults have increased as well: leveraged loan defaults over the 12 months ending in July 2020 reached approximately \$46 billion, or 4% of all leveraged loans outstanding.⁵⁸ Similarly, Figure 4.6 shows that CLOs' holdings of loans in default—which were growing before the COVID-19 economic shock—have spiked since March 2020 and account for 1.5% of CLO holdings.

Defaults do not uniformly affect the various CLO tranches. The AAA tranches are last to lose in the event of a default compared to the lower rated tranches. The losses to various tranches are a function of the aggregate portfolio defaults (individual loan-level default probabilities and default correlations) and expected recovery. The nature of the COVID-19 economic shock suggests all three—higher default rates, greater default correlations, and lower expected recoveries—going forward. Still, the AAA-rated senior tranches will not incur losses unless economic conditions worsen dramatically. For example, on a static basis, even if one were to assume zero recovery and 35% of the loans default with no recoveries, the AAA tranche would not suffer principal losses. In practice, recovery rates have historically averaged 70% and default rates have been far lower than 35%, and defaults are currently about 4% as mentioned above.

Figure 4.6. CLO Holdings where Issuer is in Some Form of Default



As for CLO market activity, while the COVID-19 economic shock initially halted new CLO issuance, the market appears headed for recovery. New issues resumed in April and have been growing since then. Spreads on newly issued AAA CLO tranches, which spiked to nearly 300 basis points in mid-April, have steadily narrowed; currently, AAA spreads stand at about 175 bps, approximately 50 bps above pre-outbreak levels.⁵⁹ Similar widening of credit spreads has been observed in the lower rated tranches.

The ultimate consequences of the COVID-19 economic shock on the leveraged loan and CLO markets remain uncertain. However, because of some of the features of the market detailed earlier (performance tests based on cost rather than market value and the prevalence of cov-lite loans), the loan defaults and impact on the CLOs will likely play out over time.

Many market participants and credit rating agencies forecast default rates for the existing cohort of leveraged loans to be in the range of 5%–10%.⁶⁰ Market pricing of the CLO tranches today suggests that the market expects most losses would be borne by the equity layer and some by the lower rated CLO tranches. To the extent the losses are concentrated among the equity tranches, the macroeconomic impact would be limited.⁶¹ One key factor balancing these considerations is that the overall enterprise value of the underlying corporate borrowers has held up well with the equity market bounce-back.

In summary, there is a heightened level of uncertainty in the leveraged loan and CLO markets, and while these markets have fared reasonably well thus far, the disruption brought on by the COVID-19 economic shock is still ongoing and their risk assessment may evolve in the future.

57 S&P, Average bid price of loans in LSTA 100 Index.

58 S&P Global Market Intelligence, “US leveraged loan default rate tops 4% as Oil & Gas pumps out sector record,” August 5, 2020

59 CLO-i, Creditflux.

60 For example, see “On Defaults and CCC Downgrades,” Morgan Stanley, 4/27/2020, and “LCD Survey: US leveraged loan default rate expected to rise to 5.3% by year-end,” S&P, available at <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/lcd-survey-us-leveraged-loan-default-rate-expected-to-rise-to-5-3-by-year-end-59375981>.

61 The equity tranche of the CLOs is typically less than 10%. Therefore, on an aggregate CLO portfolio of about \$700 billion, the total equity in CLOs is about \$70 billion.

Chapter 5: Municipal Securities Market

Key Highlights

1. Flows in and out of muni bond funds can have a large price impact on the underlying market because retail, buy-and-hold investors dominate the muni markets and as a result, most muni securities are relatively illiquid.
2. Several factors limited municipal bond dealers' liquidity provision in March 2020: the magnitude of customer selling, difficulty hedging, the decreasing number of dealers, and stress in other markets.
3. Recovery from the COVID-19 economic shock for state and local governments is uncertain, and some bonds (e.g., those backed by consumption taxes) face greater risk of impairment.
4. Robust ongoing disclosure is generally voluntary in nature.

Market Overview

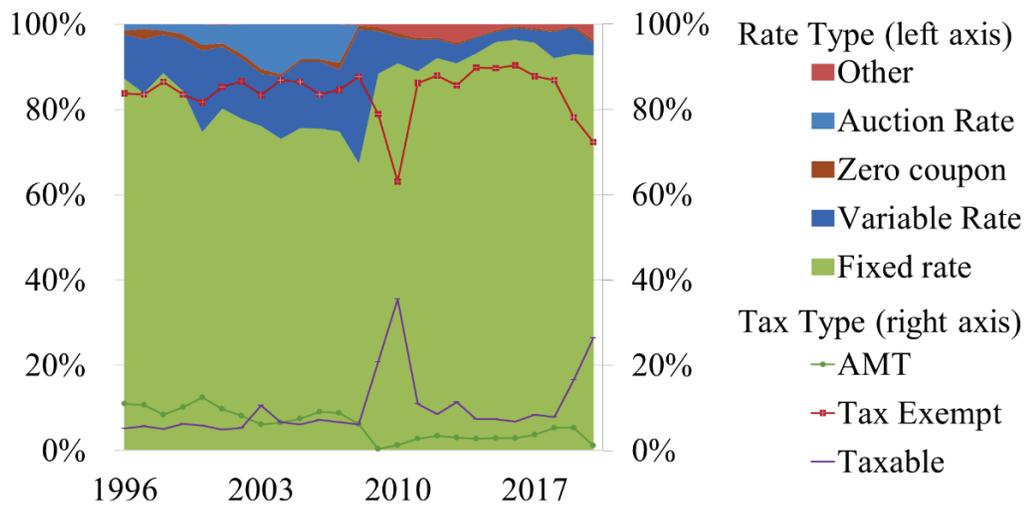
The U.S. municipal securities market has nearly \$4 trillion outstanding par value (See Figure 5.3)⁶² spread across approximately 1 million securities issued by more than 50,000 municipal entities representing an even larger number of ultimate borrowers. States, counties, cities, school districts, and other municipal entities issue municipal securities to finance infrastructure and other projects—e.g., hospitals, transportation systems, school buildings, and utilities.

Market Structure

Primary Market

The municipal securities market sees an average of 12,713 offerings totaling approximately \$412 billion in par value per year.⁶³ This translates into an average size of \$32.4 million for a primary offering, but nearly 80% of all primary offerings are \$30 million or less.⁶⁴ The typical municipal security is fixed-rate, long-term, and exempt from federal taxation. Figure 5.1 shows that, from 2008, the prevalence of fixed-rate offerings has grown considerably, while variable rate offerings have become less common.⁶⁵ During the same period, the share of taxable municipal securities offerings also grew from nearly 6% to 26.5%.⁶⁶

Figure 5.1. Issuance Levels by Coupon Type and Tax Status



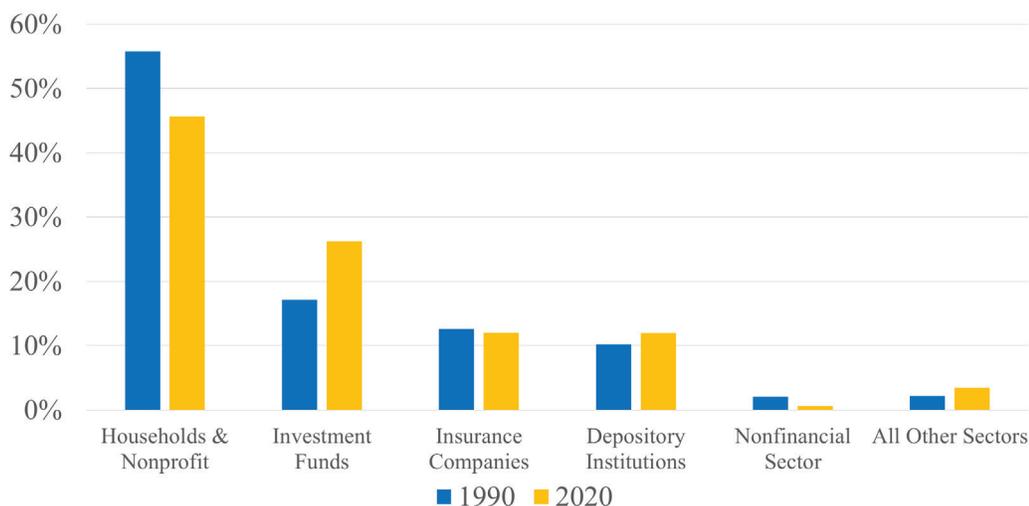
Source: SIFMA

Though once a common feature in municipal securities offerings, guarantees, and other credit enhancements have receded. For example, in 2005, bond insurance, letters of credit, or standby bond purchase agreements supported 63% of outstanding par.⁶⁷ Today only 16.3% of outstanding par is similarly supported.⁶⁸ Because of the decline in availability and use of these types of homogenizing credit enhancements, it is increasingly important for investors to evaluate the underlying credit quality of municipal securities, municipal issuers, and obligated persons.

Investor Profile

The typical municipal securities investor looks much the same in 2020 as in 1990 (See Figure 5.2). For example, retail holdings (direct and indirect) remain at around 72% of the market,⁶⁹ and four of the five largest categories of investors remain the same.⁷⁰ However, the relative absence of change in investor types masks certain changes that have occurred in the distribution of municipal securities ownership. For example, though overall retail participation appears to have remained relatively static over the years, the nature of that participation has changed significantly—direct household participation has declined approximately 10 percentage points while indirect participation through mutual funds has become more prominent, increasing by approximately 9 percentage points.

Figure 5.2. Municipal Holdings by Investor Category, 1990 vs. 2020



Source: Financial Accounts of the United States

Secondary Trading

Secondary market trading in the municipal securities market averages \$13.4 billion and 38,500 trades per day, which amounts to 0.3% of outstanding par and 3.8% of all outstanding CUSIPs, respectively.⁷¹ Similar to the primary market, the vast majority of secondary market trades occur at par levels that are significantly lower than the average trade size indicates.⁷² From January 1, 2010, through June 30, 2020, the average secondary market trade size was approximately \$290,000; however, nearly 78% of all trades were for an amount less than \$100,000. During this period, trades of over \$100,000 totaled just over 9% of all par amount traded. Given the buy-and-hold approach of most direct retail participation in the market, asset managers, who generally provide ready liquidity for relatively illiquid underlying assets, often drive the general direction of both the primary and secondary markets as the largest collective buyers and sellers of municipal securities.

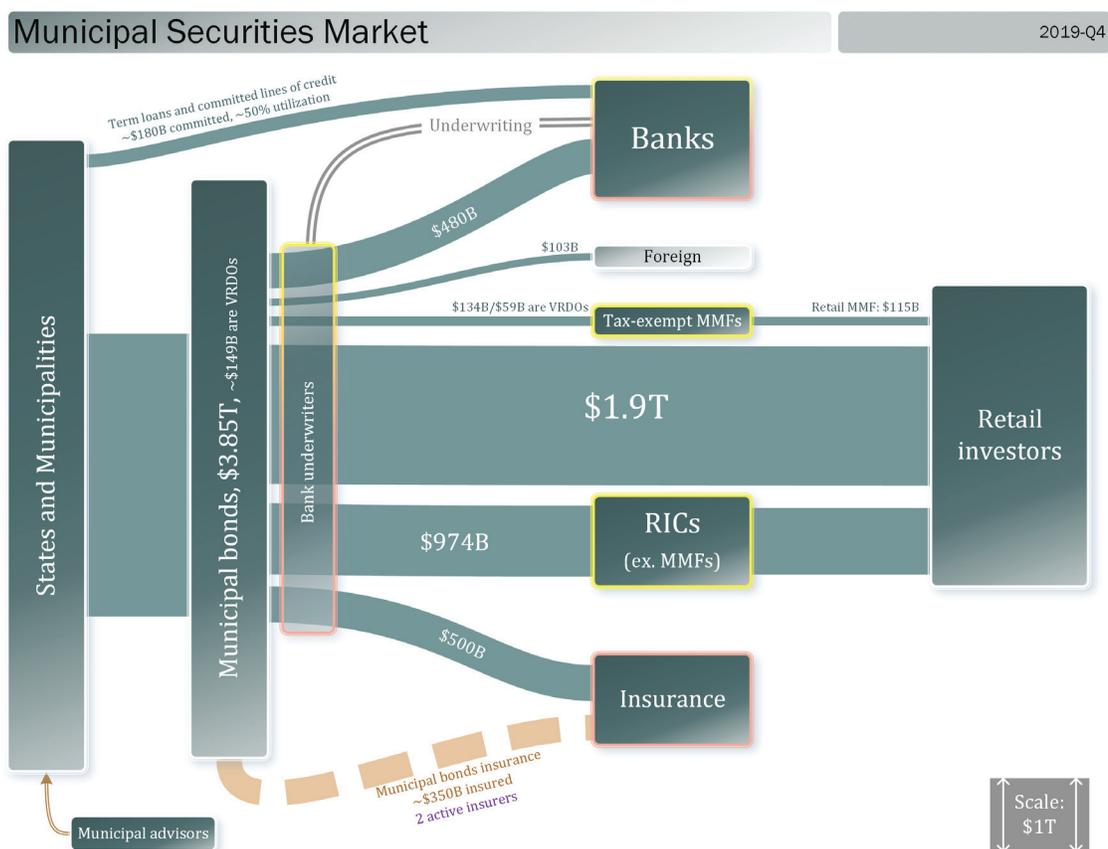
Municipal securities trade in a decentralized OTC dealer market. Brokers, dealers, and municipal securities dealers (collectively, “municipal bond dealers”) execute virtually all customer transactions in a principal capacity, with a significant portion of these trades offsetting each other within seconds.⁷³ Secondary municipal market trading is concentrated among a relatively small (but growing by percentage) subset of municipal bond dealers registered with the Municipal Securities Rulemaking Board (MSRB). For example, in 2006 1.9% of municipal bond dealers executed 25,000 or more trades, as compared to 5% in 2018, and the top 10 dealers accounted for 54.3% of all par value traded in 2018 in the municipal securities market.⁷⁴

Variable-Rate Demand Obligations & Tender Option Bonds

VRDOs are variable rate obligations that typically have a nominal long-term maturity of 20 to 30 years, but an interest rate that is reset periodically. From a peak in 2008, the variable rate market has steadily shrunk as interest rates have remained historically low and the cost of credit support facilities has increased. As of August 4, 2020, \$130.5 billion of VRDOs was outstanding,⁷⁵ compared to \$444.9 billion as of December 31, 2008.⁷⁶ VRDOs have a tender feature that allows a holder to require the issuer to repurchase the security at par plus accrued interest, which is often supported by a credit facility such as a letter of credit. Once tendered, a remarketing agent generally remarkets the VRDO. A failed remarketing could trigger a letter of credit provider's obligation to repurchase the tendered VRDOs on the municipal issuer's behalf. Despite the smaller size of the VRDO market, a large number of failed remarketings could transmit stress to banks who largely provide this credit support.

Tender option bonds (TOBs) are leveraged products that allow a special purpose trust (the "TOB Trust") to borrow at short-term rates—typically from tax-exempt MMFs—and use those funds to purchase long-term, fixed-rate municipal bonds. TOBs are used by certain municipal mutual funds to enhance returns. The leverage ratios (i.e., gearing) may vary in different TOB programs. Investors in TOBs typically bear the risk associated with the TOB Trust's underlying assets, which is amplified by the leveraged structure of the TOB Trust. As of August 4, 2020, \$108.6 billion of TOBs were outstanding,⁷⁷ compared to over \$200 billion in 2007.⁷⁸

Figure 5.3. Municipal Securities Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$1 trillion shown at bottom right for scale). Data sources and other technical details are in the Appendix.

Interconnectedness

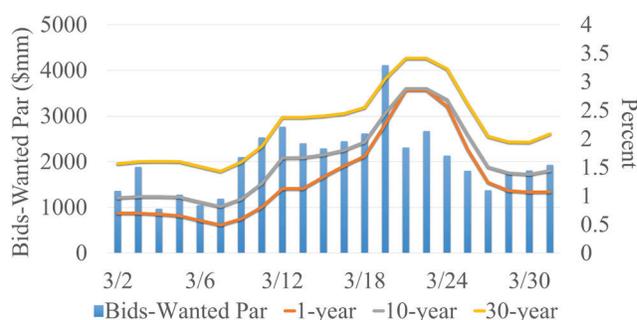
As illustrated in Figure 5.3, the municipal securities market connects with many other segments of the capital markets and the broader economy. Banks are large investors in municipal securities, and while they underwrite issues and provide lines of credit to issuers, the dominant investors are retail (directly or through RICs). As discussed later in the chapter, the combination of a small number of municipal dealers, a primarily long-term, buy-and-hold investor base, and a growing transition to fund/ETF holdings for active investors is a material source of interconnectedness in the market.

Mutual Funds/ETFs and Investors

From December 2018 through February 2020, the municipal securities market experienced 15 consecutive months of net inflows totaling \$127.8 billion into municipal mutual funds and ETFs.⁷⁹ Then, in March 2020, those funds experienced approximately \$44.5 billion of outflows (27% from HY funds) followed by another \$3.5 billion in April (64% from HY funds). This nearly \$48 billion reduction represented 6.3% of AUM as of February 29, 2020, and 37.6% of the prior 15 months' gains.⁸⁰ Bond funds and ETFs in Morningstar's "high-yield" category lost 9.2% of January 2020's AUM in March and 11.2% between March and May. All other funds lost only 4.3% of January AUM in March and began to grow again by May.⁸¹ As stated earlier, liquidity in the municipal market is generally low and dispersed, and there were limited natural buyers at this time of stress to meet the selling pressure.

These outflows put selling pressure on the municipal securities market, as measured by the par value of bids-wanted auctions. Figure 5.4 shows that leading up to March 2020, the 5-year average bids-wanted par was approximately \$723 million per day, while the March average was \$2.1 billion per day, peaking at just over \$4.1 billion on March 19. This selling pressure coincided with yield increases all along the muni yield curve (Figure 5.4, right axis).⁸²

Figure 5.4. Bids-Wanted Par and Yields

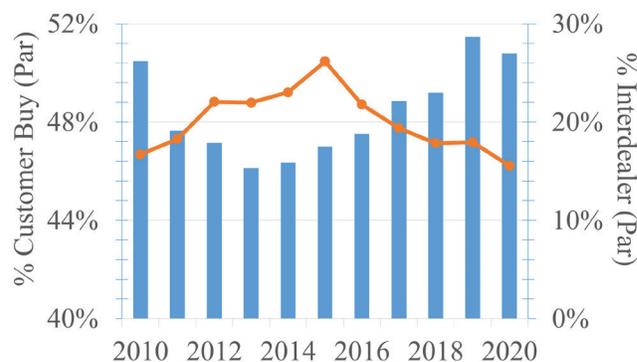


This figure plots bids-wanted par in blue bars (left axis) and municipal bond yields (right axis) during March 2020. Sources: Bloomberg and Municipal Securities Rulemaking Board

Fund Outflows and Municipal Bond Dealer Balance Sheets

The elevated bids-wanted levels triggered increased trading activity—measured by trade count and par value—in March. The increased trading activity and, more specifically, the nature of the trading activity, revealed a great deal about the pathways of liquidity in times of stress when asset managers suddenly become marginal sellers rather than marginal buyers. For example, in March 2020 daily customer purchasing increased 87% (par value) whereas interdealer activity increased 56% (par value). These data are illustrative of a years-long trend in which interdealer trading has steadily declined and direct customer buying has increased (See Figure 5.5).

Figure 5.5. Customer Purchases and Interdealer Trades



This figure shows customer buy (par) in blue bars on the left axis, and interdealer trades in orange on the right axis. Source: MSRB's EMMA site

Other factors may have also constrained municipal bond dealer provision of balance sheet liquidity. For example, the number of municipal bond dealers registered with the MSRB has declined 40% since 2006, and thus fewer counterparties are available to provide liquidity to the market. Finally, the COVID-19 economic shock affected all segments of the capital markets simultaneously during March–April 2020.

Fund Flows and the Primary Market

Another notable point of connection in the municipal securities market is the relationship between mutual fund and ETF flows and primary offering activity. In particular, similar supply and demand dynamics manifest in the primary market as in the secondary market. For example, when fund redemptions rise and funds become net sellers of municipal securities, issuers of municipal securities lose access to reliable bulk purchasers of their securities in the primary market. This constrains issuer access to the primary market during times of stress when such access might be acutely needed. This phenomenon has occurred, to varying degrees, during three of the most recent periods of municipal market stress—early 2011, summer 2013, and March 2020.

Market Dynamic and Stresses

Swings in Mutual Fund and ETF Fund Flows

Recent market activity—both the stress in March 2020 and the recovery that followed—suggests that economic shocks affect the outlook for municipal securities. This in turn triggers net selling or buying pressure on mutual fund and ETF flows, which then largely determine the market’s direction. When funds and ETFs become net sellers of their municipal holdings, secondary market supply rises (crowding out new offerings, as discussed above), prices fall, and yields rise. Conversely, when mutual funds and ETFs return to being net purchasers of municipal securities, demand outstrips supply, prices rise, and yields fall. In other words, mutual funds and ETFs provide investor access to ready liquidity that generally exceeds the liquidity directly available to the underlying securities of the mutual funds or ETFs. Thus, whether funds are flowing in or out of mutual funds and ETFs, the market is susceptible to liquidity-driven price swings. For example, during the March 2020 market stress, municipal security prices fell more than 20% over an eight-day period.⁸³

Limited Investor Base

Most municipal bond investors are retail, long-term holders of the securities, either directly or indirectly through investment funds. There are relatively few non-retail oriented active investors in the market. This market structure creates a vulnerability that is compounded when large and sudden mutual fund and ETF outflows contribute to selling pressure in the market. When the most natural buyers become sellers, few other institutions exist to provide liquidity to the market. While municipal bond dealers in past years might have provided greater liquidity through their balance sheets, as noted earlier, in recent years municipal bond dealer balance sheets have shrunk. Similarly, nontraditional municipal market investors such as hedge funds, foreign buyers, and others often enter the market only after yields increase considerably.

Limited Trading Activity

As noted above, only approximately 3.8% of all outstanding municipal CUSIPs trade per day. Low trading frequency can frustrate the price discovery process and contributes to the municipal securities market's reliance on pricing models and matrices. As a result, municipal securities are vulnerable to less accurate and idiosyncratic valuation, which can mask the true cost of liquidity for a particular municipal CUSIP.

Impact of the COVID-19 Economic Shock

Following the longest U.S. economic expansion on record, low unemployment, and generally strong fiscal management by state and local governments, municipal issuers started 2020 strong. COVID-19 quickly struck the real economy and the financial markets, including the municipal securities market. It initially triggered a liquidity crisis and, as it persisted, it introduced new credit risks to the market. The coincident economic slowdown and the uncertainty surrounding its depth and duration stressed the municipal securities market, and it may pose fiscal and operational challenges (of varying degrees) across all sectors of the market. One estimate suggests that state and local income and sales tax revenue could decline by \$54 billion in 2020 and by \$25-\$137 billion in 2021, depending on the speed of the economic recovery.⁸⁴ Other forecasts indicate a \$555 billion budget shortfall through FY2022.⁸⁵ The three largest Nationally Recognized Statistical Rating Organizations (NRSROs) changed many of their outlooks on U.S. public finance sectors to negative (including the state and local government sectors) because of the expected effects of the COVID-19 economic shock. Among the effects mentioned were projected revenue declines and increasing pandemic-related costs.⁸⁶

Any revenue shortfalls may disparately impact individual municipal securities depending on the source of security pledged, the location and severity of tax shortfalls, the nature of the projects financed, and the capital structure of the projects. For example, bonds for which the source of pledged revenue derives from sales, hotel, income, or other similar taxes might experience more stress than other bonds that have a broader-based and less volatile source of pledged revenue. However, if an issuer or obligated person has robust rainy-day funds, and/or a project has a well-funded debt-service reserve fund, the impact on bondholders of any reduction in revenues might be less severe. Similarly, revenue reliant projects that remain in the capitalized interest phase of their capital structure might face distinct challenges in light of reduced economic activity. In any case, the extent to which a municipal security experiences stress will depend on a variety of factors intrinsic and extrinsic to the project, and issuer or obligated person.

In light of the uncertainty facing investors about municipal issuers, investors benefit from robust, timely, and accurate information about the financial and operating condition of municipal issuers and obligated persons.⁸⁷ The typical historical information issuers provide to investors under Exchange Act Rule 15c2-12, such as annual information filings and audited financial statements (if and when available), may not enable investors to make informed assessments of a municipal issuer's current and expected future financial and operational condition. Accordingly, the types of disclosures that could be most helpful might be voluntary, and, under the circumstances, could be challenging to produce. A review of the MSRB's Electronic Municipal Market Access System shows that although many municipal issuers have voluntarily disclosed information to the market, many others have not. As the fallout from the COVID-19 economic shock continues to materialize, the credit implications for municipal issuers and their investors could become more acute and idiosyncratic. Therefore, robust, timely, and accurate disclosures by issuers are even more critical to market function and stability, including by limiting information asymmetries and enhancing investor protection.⁸⁸

62 Financial Accounts of the United States. Since 1990, the outstanding par in the municipal market has grown both nominally and on an inflation-adjusted basis.

63 Numbers reflect primary offerings from 2014 through 2019. Source: MSRB.

64 Id. Numbers reflect primary offerings from 2014 through 2020. During the same period, primary offerings of \$30 million or less amounted to approximately 19% of the total par issued.

65 Source: SIFMA.

66 The 2020 number is as of June 30. Source: SIFMA. The 2017 Tax Cuts and Jobs Act eliminated the ability to issue tax-exempt bonds to advance refund outstanding tax-exempt bonds.

67 SEC, Report on the Municipal Securities Market, July 31, 2012, available at <https://www.sec.gov/news/studies/2012/munireport073112.pdf>.

68 Source: Bloomberg.

69 Source: Financial Accounts of the United States.

70 As of the end of 2020Q1, the five largest categories of holders were: (i) households (45.64%); (ii) mutual funds (19.63%); (iii) U.S. chartered depository institutions (11.82%); (iv) property-casualty insurance companies (6.88%); and (v) life insurance companies (5.19%). Financial Accounts of the United States. By contrast, as of the end of 1990, MMFs were the fifth largest category of municipal securities holder instead of life insurance companies.

71 Average trading volume from May 15, 2006 through July 22, 2020. Source: MSRB.

72 Source: MSRB.

73 MSRB, Report on Secondary Market Trading in the Municipal Securities Market, July 2014, available at <http://www.msrb.org/msrb1/pdfs/MSRB-Report-on-Secondary-Market-Trading-in-the-Municipal-Securities-Market.pdf>.

74 The same pattern appears when measuring activity by par value traded. See MSRB, Dealer Participation and Concentration in Municipal Securities Trading, May 2019, available at <http://msrb.org/Market-Topics/-/media/9EF010CA1A2B4261859CF70A490C63FC.ashx?>.

- 75 Source: Bloomberg
- 76 Source: SIFMA, U.S. Municipal VRDO Historicals, June 15, 2012, available at <https://www.sifma.org/resources/research/us-municipal-vrdo-historicals/>.
- 77 Source: Bloomberg.
- 78 TOB or Not To Be: Time for a Comeback? *Financial Planning*, April 20, 2010, available at <https://www.financial-planning.com/news/tob-or-not-to-be-time-for-a-comeback>.
- 79 Investment Company Institute, Summary: Combined Estimated Long-Term Flows and ETF Net Issuance Data, available at <https://www.ici.org/research/stats/flows>.
- 80 Id.
- 81 Morningstar.
- 82 Bids-wanted par reached its 5-year peak on March 19, 2020 at just over \$4.1 billion; the next day AAA yields for 1-year and 10-year municipal securities reached their 5-year peaks at 2.85% and 2.88%, respectively, and the 30-year nearly matched its 5-year high at 3.41%. These yield levels represented increases of 2.16%, 1.91%, and 1.85%, at each tenor respectively, from the beginning of March 2020. Source: Bloomberg.
- 83 Source: Municipal Market Analytics.
- 84 Stephan D. Whitaker, Estimates of State and Local Government Revenue Losses from Pandemic Mitigation, available at <https://www.clevelandfed.org/newsroom-and-events/publications/cfed-district-data-briefs/cfddb-20200513-estimates-of-state-and-local-government-revenue-losses-from-pandemic-mitigation.aspx>.
- 85 J.P. Morgan, Municipal Markets Weekly, June 12, 2020; see also Center on Budget and Policy Priorities, States Continue to Face Large Shortfalls Due to COVID-19 Effects, July 7, 2020, available at <https://www.cbpp.org/research/state-budget-and-tax/states-continue-to-face-large-shortfalls-due-to-covid-19-effects>.
- 86 See S&P Report, Moody's Report, and Fitch Ratings, "U.S. Public Finance Rating Actions Report and Sector Updates: Second-Quarter 2020," July 8, 2020.
- 87 Jay Clayton and Rebecca Olsen, The Importance of Disclosure for our Municipal Markets, available at <https://www.sec.gov/news/public-statement/statement-clayton-olsen-2020-05-04>.
- 88 See the SEC's Fixed-Income Market Structure Advisory Committee recommendations related to disclosures, <https://www.sec.gov/spotlight/fixed-income-advisory-committee/fimsac-muni-financial-disclosures-recommendation.pdf>.

Chapter 6: Residential Mortgage Markets

Key Highlights

1. Residential mortgage debt outstanding was \$10.6 trillion in 2019Q4, with several key interconnections and some dominant entities (e.g., the GSEs).
2. A risk in the residential mortgage market worthy of continued monitoring is its reliance on short-term funding from certain nonbanks, including mREITs, government MMFs, and the FHLB system. Nonbanks originate 70% and service 50% of all mortgages. Government MMFs have increasingly funded FHLBs, who lend to their member institutions. mREITs finance their MBS portfolios mostly in the repo market.
3. Banks appear financially sound, despite their large exposure to mortgages.
4. Certain institutions, such as mREITs, deploy high levels of leverage with substantial maturity transformation. These institutions are potentially at risk because of potential constraints in short-term funding.
5. CRTs diversify some of the credit risk in the residential mortgage market away from the GSEs, but at times, they are levered by some market participants.
6. The combination of fiscal and monetary stimuli likely ameliorated the effects of the COVID-19 economic shock on mortgage borrowers.

Market Overview

The residential mortgage market is a \$10.6 trillion market (See Figure 6.1) that connects households, mortgage originators, mortgage servicers, certain government agencies and government-sponsored entities (GSEs), and mortgage investors. The federal government assumes the credit risk on a large share of single-family mortgages, leaving investors in MBS subject only to interest and prepayment risk. Significant leverage and maturity transformation occur in certain parts of this market. Households also have significant non-mortgage debt, which can affect the mortgage market, as briefly discussed at the end of this chapter.

Market Structure

The structure of the residential mortgage market can be understood by tracing the path of mortgages from households through originators to securitizers to final owners (See Figure 6.1). Other important market components include mortgage servicers, the FHLB system, private mortgage insurers, REITs, and CRTs.

Originators

In the current environment, both banks and nonbanks originate residential mortgage loans. Nonbanks are typically monoline originators, operating a lend-to-distribute model and fund originations and operations with short-term credit, often through warehouse lending with major banks.⁸⁹ As nonbanks originate about 70% of all mortgages,⁹⁰ this business model contributes to the primary mortgage market's dependence on short-term funding. Because of this reliance and the concentration of nonbanks in the origination of mortgages for borrowers with lower incomes, a contraction in warehouse lending may have a particularly acute effect on origination for lower income borrowers—e.g., Federal Housing Administration (FHA) and Veterans Affairs (VA) homebuyers, for whom nonbanks' origination share is closer to 90%.⁹¹

Securitizers

The two dominant mortgage securitizers are the Federal National Mortgage Association (FNMA, also known as Fannie Mae or Fannie) and the Federal Home Loan Mortgage Corporation (FHLMC, also known as Freddie Mac or Freddie), which own about \$5.3 trillion or about half of outstanding mortgages.⁹² These firms guarantee that MBS investors will receive all of the promised interest and principal, meaning that Fannie and Freddie retain the full amount of credit risk on all mortgages they purchase. Fannie and Freddie were created by Congress as privately owned corporations and are considered GSEs. Fannie and Freddie were placed in conservatorship by the Federal Housing Finance Agency (FHFA) in 2008.

Another critical entity in the residential mortgage market is the Government National Mortgage Association (GNMA, also known as Ginnie Mae, or Ginnie). Ginnie does not purchase loans or issue MBS but instead guarantees MBS from approved issuers. Ginnie Mae is a government-owned corporation and has the explicit backing of the U.S. government. Financial institutions other than Fannie and Freddie issue about \$2.1 trillion of MBS that Ginnie guarantees.⁹³

Overall, more than 95% of residential MBS are guaranteed by Fannie, Freddie, or Ginnie—“agency MBS.” The \$7 trillion agency MBS market is generally perceived to be almost as safe as U.S. Treasury debt, and it trades in a very liquid market. In December 2019, the average daily trading volume of agency MBS was about \$250 billion, for a daily turnover rate of 4%.⁹⁴ One reason for the very high liquidity is that most trading occurs in the “to-be-announced” (TBA) market. TBA buyers specify 6 criteria of a desired MBS—issuer, maturity, coupon, par value, price, and future settlement date—and the small number of criteria results in a small number of standardized contracts. TBA sellers agree to provide “to be constructed” MBS consistent with the criteria on the settlement date.

Private-label MBS cover a small amount of mortgages (\$433 billion as of December 2019), and they are not guaranteed by the government. This market has substantially shrunk in size since the 2008 GFC.

Investors

A wide array of institutions purchase residential mortgage exposure. Banks directly own 30% of all mortgages, or \$3.2 trillion (See Figure 6.1), as well as 32% of agency MBS. No other investors directly own meaningful amounts of residential mortgages, and the remaining 68% of agency MBS ownership is split among the federal government, RICs, insurance companies, and REITs. RICs, insurance companies, mREITs, and hedge funds purchase the private-label MBS.

Servicers

Mortgage servicing companies are the intermediary between property owners paying their monthly mortgage and the mortgage owners or MBS investors.⁹⁵ Servicers primarily handle administrative tasks such as managing escrow accounts and paying taxes, and they profit in two ways. First, the mortgage owner pays a servicing fee—either a percent of unpaid balance or a fixed amount per loan. Second, they earn money by investing the “float”—funds they control because they receive mortgage and related payments early in the month and pay MBS coupons and remit other payments later. Servicers are significantly exposed to mortgage default or delinquency risk. When property owners miss payments, servicers typically use their own liquidity to meet their obligation to MBS holders, as well as tax and homeowner’s insurance payments, for a certain period. In particular, nonbanks, thinly capitalized institutions that service about half of the U.S. unpaid principal balance of single-family mortgages,⁹⁶ are potentially subject to liquidity risk in the face of widespread delinquencies. Typically, when a borrower misses payments, nonbank servicers advance missed principal and interest, property taxes, and homeowner’s insurance, which they finance with short-term loans from commercial banks and private firms. These lending markets are cyclical and the willingness to lend hinges on perceived economic conditions and, in particular, expected delinquencies. As a result, significant adverse shifts in perceived economic conditions can result in a withdrawal of liquidity, and nonbank servicers, in particular, may be unable to obtain sufficient funding during times of financial market stress.

Federal Home Loan Banks

Another source of capital in the residential mortgage market is the FHLB, a system of 11 banks that the government established with private ownership and private capital. The capital for the FHLBs comes from equity contributions from its members (banks, credit unions, thrifts, and insurers), and these members are permitted to take out low-cost loans—called advances—from their regional FHLB. FHLB borrowing costs are low, in part because the 11 banks mutually guarantee one another’s debt. Most advances are short term, but they range in maturity from overnight to 30 years. Nearly 80% of FHLB funding, or about \$815 billion, comes from short-term capital-market debt with maturity less than 1 year, and at least \$34% or \$350 billion matures in less than 90 days. MMFs own 54% of all FHLB debt, or approximately \$553 billion.⁹⁷

As of December 31, 2019, the consolidated FHLB banks had \$55.4 billion in equity capital and 6,739 members.⁹⁸ Capital IQ has financial data for 483 FHLB-member banks as of December 31, 2019, representing about one-third of FHLB equity (\$19.7 billion). For these member banks, the total investment in the FHLB is less than 3% of the members' equity. The FHLB system levers its equity at around 20x, with assets of \$1.1 trillion at year-end 2019. Finally, the FHLB provides funding almost exclusively to its members. For the sample of 483 member banks, about 8% of total non-depository liabilities are debts due to the FHLB.

Private Mortgage Insurance

Mortgage borrowers with an origination loan-to-value (LTV) above 80% typically must obtain mortgage insurance. The FHA and VA provide insurance for or guarantee loans securitized through Ginnie Mae, whereas private mortgage insurance (PMI) companies typically provide mortgage insurance for Fannie Mae and Freddie Mac. PMI companies who are GSE counterparties are subject to Private Mortgage Insurer Eligibility Requirements (PMIERS).⁹⁹ PMI companies provide insurance against mortgage credit default with the key aim of reducing the loss severity (eventual loss due associated with a defaulted mortgage after recoveries relative to the outstanding loan amount). While PMI companies faced substantial financial stress at the height of the 2008 GFC, because of PMI, GSE loss severity was about 20 percentage points lower compared to the counterfactual without PMI (30% versus 50%). With the onset of the COVID-19 economic shock, PMI companies may again face financial stress if default rates increase and there are realized losses on foreclosure. Indeed, credit rating agencies have downgraded the credit ratings associated with PMI companies.¹⁰⁰

Real Estate Investment Trusts

A traditional REIT borrows from a bank and sells shares to investors, then uses the equity and debt capital to purchase and manage real estate such as apartment buildings, malls, or office parks. REITs are highly levered, typically at 5–10 times their equity. mREITs invest primarily in securities such as MBS, and they finance their portfolios mostly in the short-term repo market. Hybrid REITs own both physical real estate and securities. The entire REIT industry controls about \$3 trillion in real estate assets with \$2–\$2.5 trillion in liabilities, and mREITs control roughly \$600 billion in assets¹⁰¹ with about \$550 billion in liabilities. More than two-thirds of mREITs' liabilities are short-term repo funding (\$380 billion).

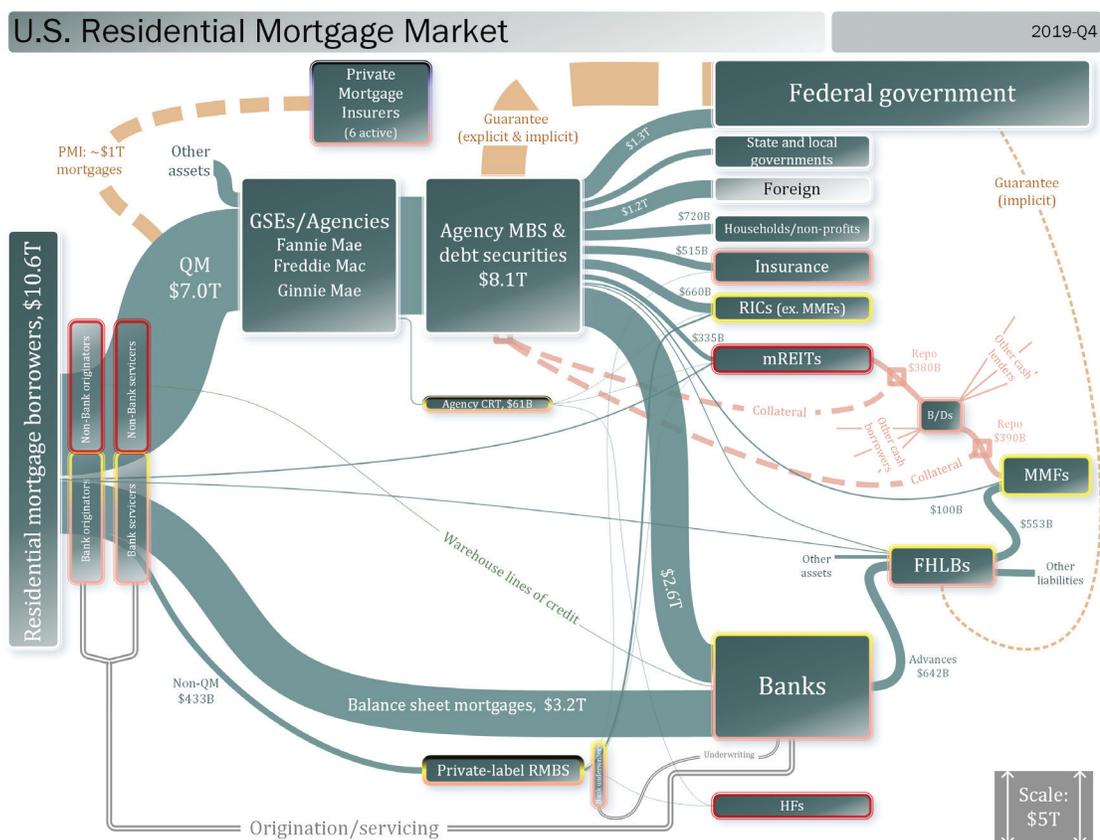
The leverage, liquidity, and risk management practices of REITs are generally subject only to market discipline. However, as with all public companies, the SEC requires public REITs to disclose their liquidity, capital resources, and results of operations. For example, public REITs must identify and report any known trends, commitments, or anything else that might materially affect liquidity. In addition, REITs conducting initial public offerings must provide additional disclosures regarding capital allocation, investment policies, and investment advisory services.

Credit Risk Transfer Securities (CRTs)

CRTs are part of a broader program initiated by the FHFA to allow Fannie Mae and Freddie Mac to transfer some of the credit risk that they—i.e., U.S. taxpayers—bear to private investors, while Fannie and Freddie remain in conservatorship. Indeed, Fannie and Freddie mitigate and transfer household mortgage default risk through three channels: (i) PMI as discussed above; (ii) CRTs; and (iii) through (re)insurance of mortgage pools. PMI covers \$1.2 trillion of unpaid principal balance (UPB) outstanding (Insurance in Force); CRTs reference \$2.1 trillion of UPB. Whereas the MBS issued by Fannie and Freddie do not entail meaningful credit risk, CRT bonds issued by Fannie and Freddie are not guaranteed and do entail substantial credit risk. A small amount invested in the CRTs exposes the investor to the credit risk of a large pool of GSE-owned mortgages. Currently, Fannie Mae's outstanding CRT securities have a market value of \$29 billion and a reference mortgage pool of \$1 trillion. Freddie Mac's outstanding CRT securities have a market value of \$32 billion and a reference mortgage pool of \$1.1 trillion. Since the start of the CRT programs, the GSEs have issued CRTs on a total of \$3.5 trillion in reference securities, and they are increasingly looking to this market to transfer their (taxpayer's) credit risk to private investors. The FHFA is assessing the capital benefits of utilizing CRTs as part of the broader capital plan for the GSEs. PMI companies also participate in the CRT market through the issuance of \$10 billion of insurance-linked notes referencing over \$1 trillion of insurance in force.¹⁰² Hedge funds, REITs, and RICs invest in CRTs.

As the CRT programs have grown in acceptance, an increasing amount of credit risk now resides in the private sector. At the end of 2019, the reference assets associated with CRTs accounted for approximately \$2.1 trillion or 37% of the outstanding Fannie and Freddie UPB (\$61 billion of market value or 1% of UPB). Diversified ownership of CRTs mitigates potential systemic risk from residential mortgage defaults.

Figure 6.1. Residential Mortgage Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$5 trillion shown at bottom right for scale). Data sources and other technical details are in the Appendix.

Interconnectedness

The \$10.6 trillion residential mortgage market, as illustrated in Figure 6.1, has several important connections with the rest of the financial system. First, the federal government plays a dominant role in this market through the GSEs and Ginnie Mae, who intermediate about \$7 trillion of mortgages. Almost all residential mortgages carry federal guarantees, which the GSEs sell as MBS debt to investors. As discussed earlier, the GSEs transfer some of the credit risk to a diversified group of investors as CRTs.

Second, banks are central to the residential mortgage market—as originators, securitizers, investors, and lenders to nonbanks—and they retain a large direct exposure to mortgage credit risk.

Third, nonbank servicers, mortgage insurers, various intermediaries, and investors in MBS are all tightly interconnected in this system. One of the intermediaries is mREITs, which invest in longer dated MBS, financed with short-term marked-to-market repo funds. Thus, they operate with high maturity mismatch, which induces them to demand large amounts of liquidity in stress situations. Around April 2020, the average daily repo volume collateralized by agency MBS was about \$500 billion, including \$457 billion in bilateral repo¹⁰³ and \$38 billion in tri-party/GCF repo.¹⁰⁴ mREITs had \$380 billion of repo liabilities outstanding as of December 31, 2019. As large users of agency MBS repo, mREITs can materially affect short-term liquidity in the repo market. Any potential price impact on these securities can have a ripple effect through the financial system because many financial institutions use agency MBS as repo collateral.

Finally, FHLB system finances its members' residential mortgage loans and investments with a majority of funding from government MMFs. FHLB securities make up approximately 20% of government MMF assets as of December 2019, so that these institutions are interdependent. These connections mean that when funds flow into government MMFs, some of those funds channel into mortgage lending via the FHLB system and its members.

Market Dynamics and Stresses

Fundamental credit risk in the residential mortgage space emanates from household defaults that have spillover effects to the rest of the mortgage finance system. Follow-on potential risks in the residential mortgage market include (i) nonbanks that have become more significant participants in the market and are more dependent on third-party short-term funding, (ii) the leverage and maturity mismatch of mREITs and hybrid REITs, and (iii) the growing connection between FHLB and government MMFs. All three risks can be traced to the entire residential market's growing dependence on short-term funding as discussed in detail below.

First, nonbanks' share in the residential mortgage market has grown rapidly in recent years. They currently originate 70% of all mortgages and 90% of Ginnie Mae mortgages. In 2014, nonbanks serviced 23% of Freddie Mac's mortgages and 30% of the mortgages in Ginnie Mae MBS. The top five nonbank servicers handled 18% of Fannie Mae's mortgages. By 2019, those numbers had increased to 39% for Freddie, 63% for Ginnie, and 28% for Fannie.¹⁰⁵ Nonbanks are generally not subject to the same capital and liquidity requirements as banks and cannot raise deposits. Instead, they rely on short-term funding and lines of credit to fund their business in both originations as servicing. If economic conditions deteriorate, warehousing lines of credit for nonbanks might decrease, which would reduce the availability of credit for mortgage borrowers.

Second, the mREIT sector grew significantly after the 2008 GFC, from \$168 billion in assets in 2009 to almost \$700 billion in 2019. Repo financing, collateralized by agency MBS, is the main source of mREITs' funding. The resulting maturity mismatch of the mREITs can result in considerable exposure to interest-rate risk that is amplified by leverage. Economic shocks that prompt mREITs to demand a large amount of liquidity and/or require them to quickly delever could stress the MBS market and result in wider spreads temporarily.

Third, the FHLB system has also grown to over \$1.2 trillion in assets, most of which (\$900 billion) is advances to members collateralized by mortgages, and FHLB assets are financed mainly by short-term notes purchased by MMFs and other investors. The volume of mortgage origination could suffer if either the FHLB system or the government MMFs come under pressure. However, the amount of FHLB funding on Figure 6.1 is small relative to the size of the U.S. residential mortgage market, and FHLBs have not been a source of weakness during the COVID-19 economic shock. Government MMFs received sizeable inflows in March 2020, which reinforced demand for FHLB securities.

Another risk in the residential mortgage market comes about from CRT securities that have high indirect leverage and high risk. In general, dispersing this credit risk across a range of players that are most willing to bear it is systemically safer than concentrating it in a few government-backed players. In theory, this should be a positive development for the markets. However, the ownership of CRTs is still somewhat concentrated, and it is unclear that the holders of CRT securities would be able to bear the risk of a significant adverse shock in the residential mortgage market. For example, the nature of certain CRT investors' financing raises concerns. In some cases, investors finance their CRT securities in the short-term repo market. This is equivalent to using the indirectly levered CRT securities to obtain more leverage. This type of financing can potentially create a feedback loop of forced selling and margin calls. In the lead-up to March 23, 2020, some investors did receive margin calls that they were unable to meet, but the subsequent actions of the Federal Reserve and the resulting stability in the market ameliorated this stress.

Finally, it is important to recognize that banks are major holders of mortgage credit risk. In addition, they face the risks of maturity mismatch and leverage, much like mREITs. However, recent research suggests that deposits' effective maturity is considerably greater than zero (their contractual maturity),¹⁰⁶ and the results of the Federal Reserve's June 2020 stress tests indicate that under the most adverse scenarios, all banks tested would remain above minimum capital levels.¹⁰⁷

A final point of strength in this market is the matched-funding nature of MBS issuances. These issuances have long-dated assets (mortgages) and long-dated liabilities (MBS), which limits their exposure to interest-rate risk.

Impact of the COVID-19 Economic Shock

During March 2020, the agency MBS market experienced stress as fears rose about the impact of COVID-19 on unemployment and future mortgage delinquencies. Agency MBS prices declined and transaction costs (bid-ask spreads) rose, leading to tightened liquidity in the agency MBS repo market. The Bloomberg Barclays U.S. MBS Index¹⁰⁸ rose slightly in early March before falling 2.2% between March 9 and March 19. Effective bid-ask spreads in the TBA market increased from about \$0.02 in February 2020 to a peak of more than \$0.20 in mid-March.¹⁰⁹ At the same time, the decline in MBS values resulted in marked-to-market losses and rising market-valued leverage for many investors. MBS holders looking for liquidity began selling—for example, mREITs engaging in deleveraging transactions. However, buyers for the suddenly large supply of agency MBS were few. The Federal Reserve intervened in mid-March and bought \$458 billion of agency MBS between March 13 and April 13, followed by \$203 billion more between April 14 and May 13. Since March, the Federal Reserve has purchased \$1.05 trillion of agency MBS,¹¹⁰ comparable to the \$1.25 trillion purchased between January 2009 and March 2010. The Federal Reserve's intervention since March 2020 has stabilized this market.

In March 2020, Congress passed the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which affects the mortgage market in a few ways. CARES helps households meet expenses—including mortgage payments—by authorizing one-time cash payments, along with temporary unemployment benefits of up to \$600 per week (expired July 31). The act also allows borrowers of federally backed mortgages to postpone mortgage payments, and imposes a moratorium on evictions, which expired on July 24, from homes purchased with these mortgages. Indeed, policies that keep distressed borrowers in their homes markedly reduce home mortgage foreclosures and delinquencies.¹¹¹ The Federal Reserve lowered the federal funds rate to near zero and swiftly injected liquidity into the market through the purchase of \$572 billion of agency MBS from February 3 to June 24, 2020. This lowered mortgage interest rates and boosted MBS liquidity at the height of the crisis. Lower mortgage rates allowed existing mortgagees to refinance into loans with lower monthly payments, which eased their debt service burden and possibly stimulated follow-on consumption. Likewise, the Federal Reserve's actions enhanced home affordability as lower interest rates softened payment-to-income constraints. Together, the CARES Act and recent Federal Reserve actions constituted direct housing stimulus by targeting distressed borrowers, existing mortgagees, and potential homebuyers.

Mortgage servicers were initially concerned about the impact of mortgage forbearance on their solvency, especially the non-depository servicers who are not typically as well capitalized or diversified as banks. The agencies have since promised some assistance to servicers who cannot make MBS payments related to mortgages in forbearance. Moreover, the Federal Reserve's monetary stimulus improved the liquidity of the MBS market and lowered interest rates, which made mortgages more affordable. The CARES Act unemployment assistance and mortgage forbearance likely reduced the incidence of delinquencies and foreclosures.¹¹² Fewer mortgage defaults in aggregate may have mitigated the COVID-19-induced financial strain on non-depository originators and servicers as well as their funding sources. One noteworthy interconnection—and

a potential risk—arises because mortgage servicers often use their mortgage servicing rights as collateral to fund their leverage. In periods of stress in the mortgage market, the value of these servicing rights declines, which further stresses the mortgage servicers' financial condition.

As of August 10, 2020, 7.4% of homeowners (3.9 million) were in forbearance. The forbearance rate is much higher for FHA and VA mortgages, at 11.5%, suggesting that lower income borrowers are more likely to choose forbearance.¹¹³ According to data from the Federal Reserve, the delinquency rate for all single-family residential mortgages reached 11.5% in the first quarter of 2010.¹¹⁴ The national eviction moratorium and the \$600 weekly benefit in the CARES Act have now both expired (on July 24 and July 31, respectively). If mortgage delinquencies and defaults rise in the coming months, they would likely contribute to financial stress for mortgage lenders, MBS investors, nonbank servicers, and borrowers.

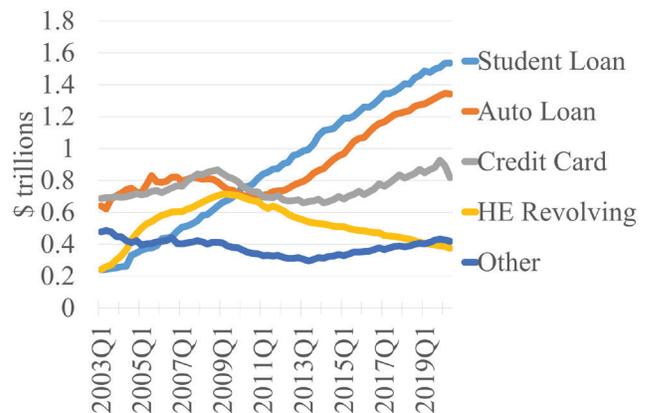
Non-Mortgage Consumer Debt

While the residential mortgage market is the dominant consumer finance market, the other consumer finance markets, including credit cards, personal loans, student loans, and auto loans, together represent \$4.2 trillion of outstanding credit.¹¹⁵ Other than government-guaranteed student loans, most of this is financed on banks' balance sheets, and approximately \$400 billion of this is funded in the consumer ABS markets (See Figure 6.3a).

U.S. non-mortgage household debt has steadily grown 105% from 2003Q1 to 2019Q4, but only increased from 18% to 19% of GDP over this time period.¹¹⁶ In particular, student loan debt rose 526% between 2003Q1 and 2019Q4, from \$240 billion to \$1.5 trillion or from 2.2% of GDP to 6.9% (See Figure 6.2). Over 90% of outstanding student loans are held by the federal government¹¹⁷ and so cannot be discharged through bankruptcy. Thus, an increase in student loan defaults or loans in forbearance may adversely impact economic activity and consumer borrowing in other sectors.

Likewise, auto loan debt grew by 108% from 2003Q1 to 2019Q4, from \$640 billion to \$1.3 trillion or from 5.7% of GDP to 6.1% (See Figure 6.2). Although auto debt has increased markedly, the composition of auto loan origination tilted towards subprime borrowers in the middle part of the decade before falling over the last five years. In 2010Q1, 30% of auto loan originations were subprime (credit score < 660). Then the subprime origination share peaked at 39% in 2015Q2 before falling back to 30% in 2019Q4. A rise in subprime auto loan defaults may correspond with other economic hardships for subprime borrowers.

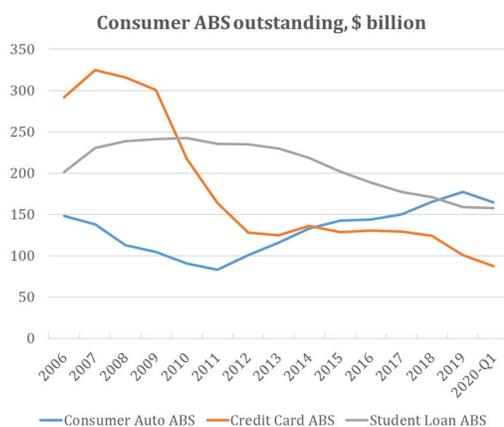
Figure 6.2. Nonmortgage Household Debt 2003Q1-2020Q2



Source: Federal Reserve Bank of New York Center for Microeconomic Data

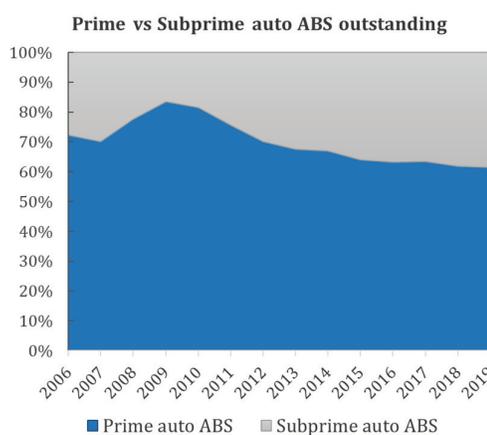
Currently about 15% of consumer auto loans and 10% of credit card and student loans are securitized through private-label ABS.¹¹⁸ Like the composition of auto loan originations, the composition of auto ABS securitizations has shifted toward subprime borrowers. In 2009, less than 20% of all auto ABS auto loans were subprime, and now almost 40% are.

Figure 6.3a. Consumer ABS Outstanding



Source: SIFMA

Figure 6.3b. Auto ABS by Type



Source: SIFMA

Overall, the primary risk of consumer non-mortgage loans lies in the creditworthiness of the ultimate borrowers behind the loans. The COVID-19 economic shock has directly impacted individual consumers’ ability to repay their loans. The impact might be especially acute for subprime auto loans, according to market reports.¹¹⁹ Yet, analogous to the foregoing discussion of mortgage markets, the combination of fiscal and monetary stimulus likely ameliorated the effects of the COVID-19 economic shock on consumer borrowers and consumer debt investors. Indeed, the CARES Act provided notable unemployment assistance and mortgage forbearance to distressed households. These policies likely reduced default probabilities on both consumer and mortgage debt. Furthermore, the Federal Reserve’s monetary stimulus and liquidity facilities lowered interest rates for borrowers and boosted market liquidity, easing credit concerns and stabilizing credit markets at the height of COVID-19–induced financial market distress.

89 Typically, nonbanks fund mortgage originations by drawing on pre-approved credit lines from banks, where the originated mortgage is collateral to obtain the “warehouse loan.” When the loan is sold, the nonbank repays the bank. Kim et al. (2018; Brookings Papers on Economic Activity) estimate that roughly half the annual \$2 trillion new mortgage origination is funded by warehouse lines. However, the amount of warehouse lines of credit outstanding at any one time is small.

90 Kim et al. (2018; Brookings Papers on Economic Activity).

91 Kim et al. (2018; Brookings Papers on Economic Activity) find that nonbanks originate 90% of Ginnie Mae mortgages. FHA and VA loans make up almost 95% of Ginnie MBS (Ginnie Mae, Global Markets Analysis Report, June 2020).

- 92 Fannie Mae and Freddie Mac 10-K reports for 2019.
- 93 Ginnie Mae's Unpaid Principal Balance Summary, December 2019.
- 94 Ginnie Mae, Global Markets Analysis Report, June 2020.
- 95 Mortgage owners may also service their own loans.
- 96 Karan Kaul and Laurie Goodman, Should Nonbank Mortgage Companies Be Permitted to Become Federal Home Loan Bank Members?, Urban Institute, June 2020.
- 97 See FHLB 2019 Annual Report for FHLB liabilities; see Figure 5.1 for MMF lending to FHLBs.
- 98 FHLB 2019 Annual Report.
- 99 See e.g., <https://sf.freddiemac.com/general/private-mortgage-insurer-eligibility-requirements-pmiers>
- 100 "Outlooks On Five U.S. Private Mortgage Insurers Revised To Negative Due To Elevated Credit Risk From COVID-19." S&P Global Ratings. March 26, 2020.
- 101 mREITs own \$335 billion of agency MBS and \$273 billion of directly-owned mortgages (primarily commercial).
- 102 http://www.urban.org/sites/default/files/publication/92676/2017_08_18_sixty_years_of_pmi_finalizedv3_0.pdf. Currently, PMI companies can offload mortgage insurance through insurance-linked securities (ISLs). Currently, PMIs have issued 24 ILN deals since 2015, transferring \$10.1 billion of risk on over \$1.2 trillion of Insurance in Force (IIF). Deal sizes have ranged from \$211M to \$701M across the 24 ILN transactions. Mortgage insurance-linked notes transaction data taken from Artemis Deal Directory; IIF taken from SEC filings for the six private mortgage insurers (Arch, Essent, MGIC, Radian, NMI and Genworth).
- 103 SIFMA Repo Fact Sheet April 2020.
- 104 Federal Reserve Bank of New York, <https://www.newyorkfed.org/data-and-statistics/data-visualization/tri-party-repo/index.html>.
- 105 Annual reports from 2015 and 2019 for Fannie Mae, Freddie Mac, and Ginnie Mae.
- 106 Drechsler, Savov, and Schnabl, 2018, "Banking on Deposits: Maturity Transformation Without Interest Rate Risk," NBER working paper 24582.
- 107 Press release, June 25, 2020, Board of Governors of the Federal Reserve System.
- 108 Bloomberg Barclays U.S. MBS Index Total Return Value Unhedged USD (LUMSTRUU:IND).
- 109 Logan, Lorie K., The Federal Reserve's Market Functioning Purchases: From Supporting to Sustaining, speech given in SIFMA Webinar on July 15, 2020.
- 110 Federal Reserve Bank of New York.
- 111 Gabriel, Iacoviello, and Lutz (2020, *Review of Financial Studies*).
- 112 See Gabriel, Iacoviello, and Lutz (2020, *Review of Financial Studies*) for an overview of the foreclosure externality literature.
- 113 Black Knight.
- 114 Board of Governors of the Federal Reserve System (U.S.), Delinquency Rate on Single-Family Residential Mortgages, Booked in Domestic Offices, All Commercial Banks [DRSFRMACBS], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DRSFRMACBS>, August 14, 2020.
- 115 Source: Financial Accounts of the United States and Federal Reserve Board, Consumer Credit.
- 116 New York Federal Reserve, Center for Microeconomic Data; U.S. Bureau of Economic Analysis, Gross Domestic Product [GDP], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/GDP>, September 7, 2020.
- 117 <https://studentaid.gov/data-center/student/portfolio> and Federal Reserve, Consumer Credit.
- 118 Sources: Financial Accounts of the United States and SIFMA.
- 119 See, e.g., MSCI, Consumer ABS: Recovering from Coronavirus? Available at <https://www.msci.com/www/blog-posts/consumer-abs-recovering-from/01919308305>.

Chapter 7: Commercial Mortgage Markets

Key Highlights

1. Commercial mortgage debt grew steadily over the last seven years to \$4.6 trillion by 2019Q4, but the aggregate current LTV ratio has stayed relatively constant, in part because of a rapid rise in property values.
2. Banks are the largest holders of CRE mortgages, followed by GSEs and insurance companies.
3. CRE loans held on banks' balance sheets are often nonstandard mortgages with less stable future cash flows compared to those that banks supply to CMBS for securitization.
4. Balance sheet lenders, such as banks and insurance companies, have greater flexibility to renegotiate loan terms during periods of economic distress than CMBS servicers do for securitized loans.
5. As of July 2020, CRE property prices were similar to their pre-COVID-19 levels, but the CRE market faces uncertainties about the return of economic activity, mortgage forbearances, and eviction moratoria. Going forward, the impact of the COVID-19 economic shock is likely to be uneven across the multifamily, office, health care, hospitality, and retail CRE sectors.

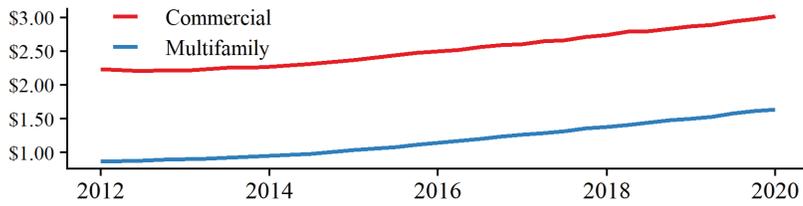
Market Overview

U.S. CRE mortgage debt outstanding has grown steadily since the 2008 GFC, from \$3.1 trillion in 2012Q1 to nearly \$4.6 trillion in 2019Q4 (See Figure 7.2). The CRE mortgage market comprises asset-backed loans from two key sectors, multifamily (\$1.6 trillion) (e.g., apartment buildings) and commercial (\$3 trillion) (e.g. office, retail, apartment, industrial, and hospitality).

As seen in Figures 7.1a–7.1c, aggregate debt levels in this market have increased materially but have been balanced by price increases. These price increases have been, at least in part, facilitated by falling interest rates. These trends together have contributed to the stability of LTV.

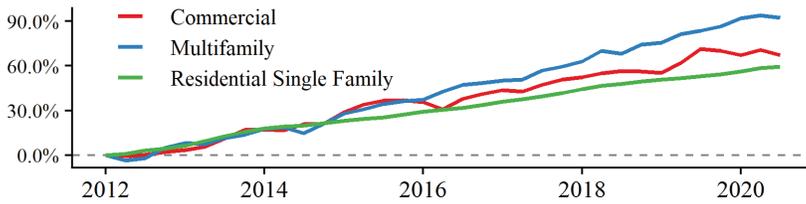
Figure 7.1a shows that the amount of debt outstanding has increased substantially from 2012Q1 to 2019Q4 for both the commercial (+32%) and the multifamily (+86%) sectors. Figure 7.1b plots the price indices and shows that average property prices have also grown. Figure 7.1c plots the difference in aggregate debt and average property price (Figures 7.1a–7.1b). In the aggregate, property price growth has outpaced debt growth for the CRE market overall by nearly 22 percentage points.¹²⁰

Figure 7.1a. Cumulative Commercial Mortgage Debt by Sector (\$ trillions)



Commercial and multifamily debt have both increased substantially. From 2012Q1 to 2019Q4, commercial debt rose by 32% and multifamily debt jumped by 86%. Source: Financial Accounts of the United States

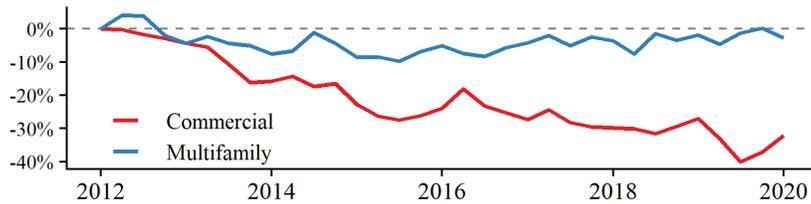
Figure 7.1b. Cumulative CRE Price Growth by Sector



Average property prices have also risen for both sectors at a faster pace than single-family residential prices. Sources: CoStar and S&P Case-Shiller.

Figure 7.1c. Difference in Debt and Price Index Growth

Note: Debt growth (from 7.1a) minus price growth (from 7.1b)



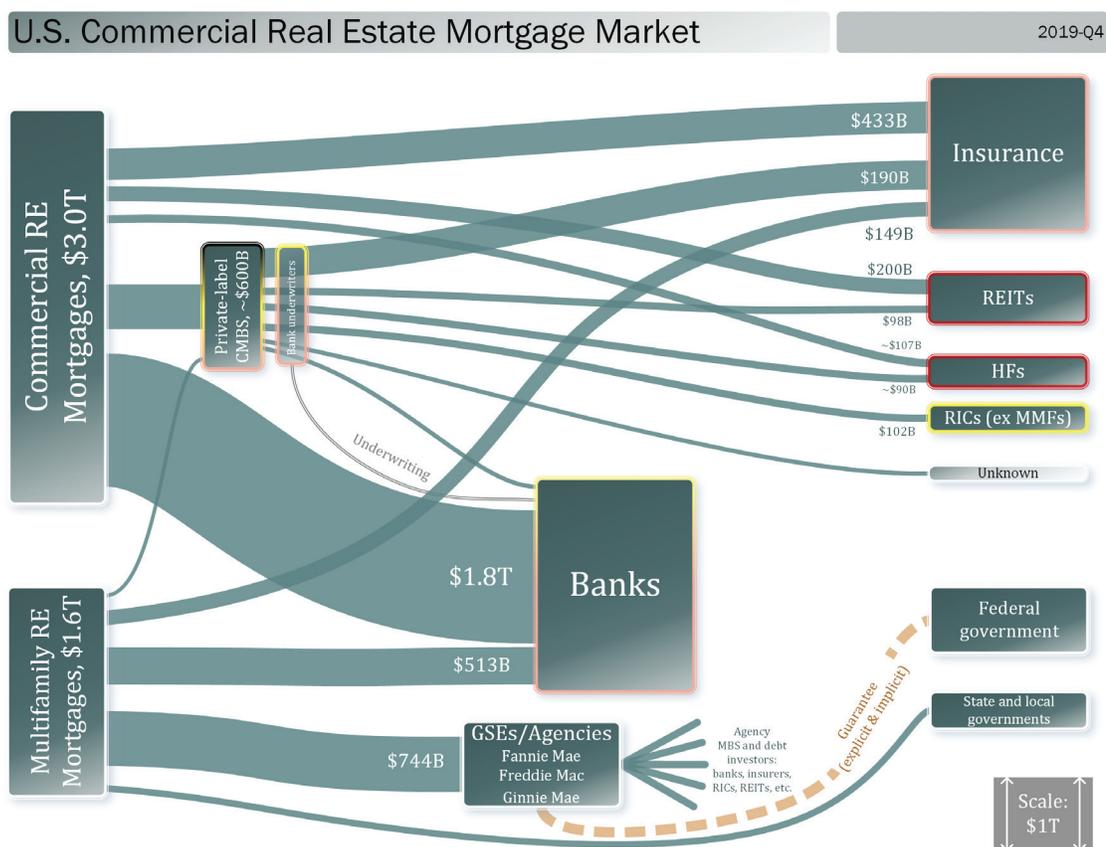
The difference between cumulative debt growth and property price growth is close to 0% for multifamily and is -40% for commercial, implying stable or falling LTVs for these sectors.

Commercial debt is substantially larger than multifamily debt, so aggregate property price growth in the CRE market has outpaced debt growth by nearly 22 percentage points.

Interconnectedness

Figure 7.2 depicts the connections between CRE debt holders, the multifamily and commercial sector intermediaries, and end debt holders. Banks are the most prominent financial institutions in CRE mortgage market. In 2019Q4, banks held \$1.8 trillion of commercial mortgage-backed debt and \$513 billion of multifamily debt. Insurance companies, like banks, are also balance sheet lenders that keep loans in portfolio and typically underwrite high-quality loans with lower relative default probabilities.¹²¹ At year-end 2019, insurance companies held \$772 billion in CRE mortgage debt, with about 80% in the commercial sector and the vast majority held by life insurance companies. Commercial mortgages represent about 8.5% of insurance company cash and invested assets with 25% in multifamily, 24% in office, 18% in retail, 12% in industrial, 4% in lodging, and 17% in other.¹²²

Figure 7.2. Commercial Mortgage Market Size and Interconnections



This figure shows borrowers on the left and lenders on the right, so that credit risk flows from left to right and money flows from right to left. The width of the bands represents outstanding credit as of December 31, 2019 (\$1 trillion shown at bottom right for scale). Data sources and other technical details are in the Appendix.

Banks also play a substantial role in the origination of mortgages eventually sold into CMBS. CRE mortgages that banks hold in their portfolio differ notably from the loans they supply to CMBS securities.¹²³ Loans supplied to CMBS securities are typically homogeneous in nature (e.g., fixed-rate loans based on stable income-generating properties), while mortgages retained for bank portfolios often are nonstandard (e.g., floating-rate, construction, or owner-occupied loans). Moreover, bank portfolio mortgages are often riskier than CMBS loans, as CMBS loan repayment agreements are quite rigid, and thus banks generally are in a position to renegotiate terms in the event credit quality decreases. Because banks are highly regulated entities with portfolio oversight, this market bifurcation results in more supervisory attention and more avenues for debt renegotiation in portions of the CRE mortgage market that may be subject to less stable cash flows. In addition, the Dodd-Frank credit risk retention requirements may have further reduced risk in CMBS loans, with loan quality increasing following policy implementation.¹²⁴

More broadly, private-label CMBS debt outstanding at year-end 2019 was approximately \$600 billion. This sector is more heavily weighted towards multifamily loans. Data from Bloomberg indicate that multifamily properties back about 60% of outstanding CMBS loans—office buildings about 12%, retail about 8%, and hospitality a little over 3%. Other CRE sectors account for the remaining 17% percent of the market (Figure 7.3). The distribution of CMBS unpaid principal balance (left panel) differs from the distribution of property values (right panel), indicating that the CMBS market is weighted more heavily towards multifamily loans.¹²⁵

Figure 7.3a: CMBS Loans by Type

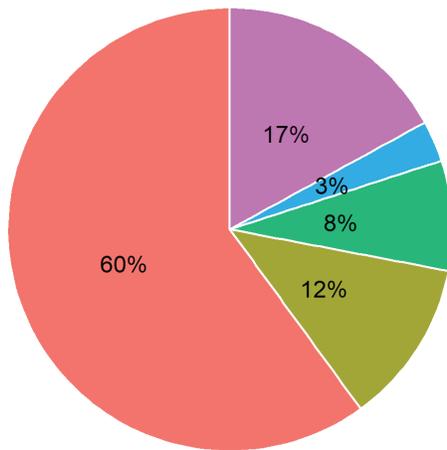
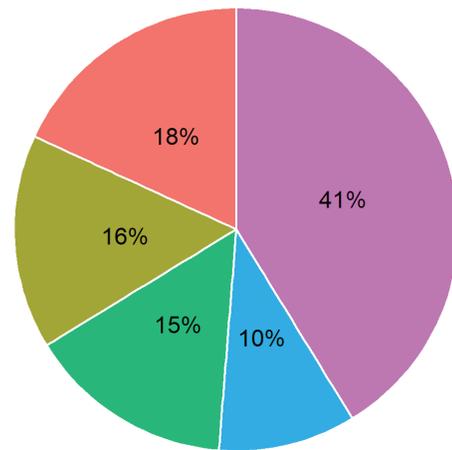


Figure 7.3b: CRE Total Assets by Type



Source for 7.3a: Bloomberg; source for 7.3b: NAREIT

Typically, CMBS securitizers originate or purchase CRE loans before packaging and selling them to investors. CMBS securitizers face market risk (known as “warehousing” risk) during the time between loan origination/purchase and securitization. Warehousing duration differs markedly across securitizers; those with larger balance sheets tend to hold CRE mortgages for longer. In economic expansions, warehouse durations can be quite short.¹²⁶ During a contraction, however, warehousing durations may increase, potentially stressing securitizers’ balance sheets and contracting credit supply for CRE borrowers.

Other large entities in the CRE mortgage market include the GSEs and REITs. GSEs operate in the multifamily sector to facilitate affordable housing. Investors in GSE CMBS are not subject to credit risk.

Outstanding GSE multifamily MBS grew from \$92 billion in 2012Q1 to \$380 billion in 2019Q4, a more than fourfold increase. In 2019, Fannie Mae, for example, issued \$70 billion of multifamily MBS (\$61.9 billion conventional, \$2.7 billion student housing, \$3.1 billion senior housing, and \$2.5 billion manufactured housing). Of the loans in these MBS pools, only \$4.9 billion was associated with small balance or 5-50 unit loans, meaning that the majority of the loan balances were associated with larger properties.

Finally, REITs hold about \$200 billion of CRE mortgage debt, with 90% of this debt in the commercial sector. Looking more broadly at CRE REITs, data from Bloomberg indicate that in 2019Q4 the CRE REIT sector had a debt ratio (debt / market cap, a common valuation tool in the REIT industry) of about 29%.

After the onset of the COVID-19 economic shock, the aggregate debt ratio changed little, increasing to 30% in 2020Q2. Debt ratios, however, differ across CRE REIT subsectors, especially following COVID-19, as the market-cap-weighted standard deviation of the debt ratio in 2020Q2 was 11.7%. The heterogeneity across CRE REIT subsectors stems from differences in pre-COVID-19 debt ratios as well as financial performance during the COVID-19 economic shock. Industrial REITs, with the largest market cap in 2020Q2 of \$131 billion (20% of industry total), had a debt ratio of 16% in 2020Q2, little changed from 17% in 2019Q4. Industrial REITs may have been less affected by COVID-19. Whereas the debt ratio for hotel REITs increased from 30% in 2019Q4 to 46% in 2020Q2, the revenue streams generated by hotels nearly stopped with the COVID-19 lockdowns. Finally, some hybrid REITs have agency MBS securities in their portfolios and operate in the CRE and CMBS space and may obtain short-term funding from repo markets.

See the “Residential Mortgage Markets” chapter for more on mREITs in the single-family mortgage sector.

Market Dynamics and Stresses

Banks hold a notable portion of commercial mortgages in their held-for-investment portfolios while also operating as securitizers for CMBS. They may be exposed to balance sheet stresses associated with a wave of commercial mortgage defaults.¹²⁷ Insurance companies also have significant exposure to potential commercial mortgage defaults both through loans held in portfolio and through CMBS. Yet, as noted above, insurance companies have traditionally underwritten higher quality loans. Finally, as previously discussed, distressed loans held by banks and insurers generally are easier to renegotiate compared to loans held in CMBS. If a CMBS-held loan goes into default, it triggers the engagement of special servicers who represent a pool of investors and the servicers may be less willing or able to offer forbearance or quick restructuring of the CRE debt. Moreover, special servicers may also be incentivized to sell the property outright rather than pursue a restructuring and/or grant forbearance.

Impact of the COVID-19 Economic Shock

With the onset of the COVID-19 economic shock, both production and consumption patterns in the real economy have changed markedly with potentially significant cascading effects across CRE sectors. For example, a sustained increase in remote work may move economic activity from urban clusters to the suburbs, with geographic implications for the income streams associated with apartments, office buildings, and regional malls, depending on location. As the duration and long-term effects of the economic slowdown due to COVID-19 are uncertain, so is the direction of CRE values.

Current evidence of the effects of the COVID-19 economic shock on CRE values are mixed. CMBS 30+ day delinquencies spiked to over 10% of outstanding loans in June 2020 before falling slightly in July.¹²⁸

Yet delinquencies as of July 2020 were concentrated in the lodging and hospitality sectors with delinquency rates over 20% and 15% respectively, while the share of delinquent loans in the multifamily, office, and industrial sectors remained below 5%. In another contrast, the share of CMBS loans transferred to special servicing, which typically occurs when a commercial mortgage becomes 60 days delinquent, have spiked from about 1.5% before COVID-19 to nearly 7% in July 2020.¹²⁹ However, CRE property prices have barely budged: Figure 7.1b plots repeat-sales property prices through June 2020. In the commercial and multifamily markets, prices have dropped only slightly, suggesting that COVID-19 has had little impact on prices thus far. Steady property prices may be the result of a reduction in both supply *and* demand as buyers may be hesitant to purchase properties amidst CRE market uncertainty, and sellers may hope to receive better price offers and experience more liquid markets in the future. This hypothesis is supported by data from CoStar, which indicate that transactions in June 2020 fell 54% year-over-year.

Eviction moratoria and related policy responses may further affect the CRE market going forward. The CARES Act implemented an eviction moratorium from March 27 through July 24, 2020, and several local governments have enacted related policies that even extend to business evictions.¹³⁰ An expiration of these moratoria may lead to rising evictions and adverse follow-on economic effects.¹³¹

Finally, just as in the single-family residential sector, CRE mortgage borrowers can apply for mortgage forbearance. From April to June 2020, CMBS servicers received forbearance requests on mortgages associated with nearly one-quarter of outstanding CMBS debt but only granted forbearance on mortgages associated with 3.5% of CMBS debt.¹³² Relief requests have emanated mostly from the hardest hit CRE subsectors (47.3% lodging, 38.3% retail, 5.2% mixed use, 3.8% multifamily, 3.5% office, 1.2% industrial, 0.2% other), highlighting the heterogeneous effects of the COVID-19 economic shock.¹³³ Loan modifications have also varied markedly

across subsectors. Nearly 9% of the outstanding loan balance backed by lodging establishments has been modified, compared to just 4% for retail as of mid-July 2020.¹³⁴ This disparity is largely due to differences in available reserves to sustain operations as hotels often have larger available reserves to account for seasonal revenue streams and capital improvements, while retail firms typically have less available cash on hand. Finally, as noted above, banks and other balance sheet lenders have more flexibility than CMBS servicers to renegotiate loan terms. Indeed, anecdotal evidence suggests balance sheet lenders have been more willing to grant forbearance requests.¹³⁵

In summary, the CRE credit markets are sizable and involve various types of investors, some of which are significantly leveraged. Disruptions in certain subsectors of the CRE credit market have been significant while other subsectors have been relatively stable, in part because of a reduction in activity in both the credit markets and the underlying CRE market. The full impact of the COVID-19 economic shock on this sector is uncertain, but is likely to be significant although not uniform as different subsectors and market participants are likely to see a disparate impact.

120 Average property price increase understates the increase in aggregate property value under the assumption that the number of properties also rises during expansions, implying that total asset values have most likely grown faster than total debt. From 2012 to 2019, 96,000 new multifamily buildings were completed, in line with an overall expansion in the number of properties outstanding. Source: U.S. Characteristics of New Housing. <https://www.census.gov/construction/chars/> (Table: Multifamily buildings).

121 Black et al. 2011; *Journal of Financial Services Research*.

122 "U.S. Insurers' Cash and Invested Assets Reach Almost \$7 Trillion at Year-End 2019." NAIC Special Report. "U.S. Insurers' Exposure to Mortgage Loans Continues to Steadily Increase Through Year-End 2019." NAIC Special Report.

123 Black et al. 2017; *Journal of Real Estate and Finance Economics*.

124 Furfine 2019; *Journal of Financial Services Research*.

125 CRE asset values from <https://www.reit.com/data-research/research/nareit-research/estimating-size-commercial-real-estate-market-us>.

126 Black et al. 2011; *Journal of Financial Services Research*.

127 <https://www.cnn.com/2020/06/25/fed-puts-restrictions-on-bank-dividends-after-test-finds-some-banks-could-be-stressed-in-pandemic.html>.

128 <https://www.reit.com/news/blog/market-commentary/cbms-delinquency-rate-drops-july>.

- 129 “Special servicing volume continues to balloon while payments fall further delinquent.” Moody’s Investors Service. July 23, 2020.
- 130 See Section 4024 of the Coronavirus Aid, Relief, and Economic Security Act (P.L. 116-136) (CARES Act). See also, <https://dcba.lacounty.gov/noevictions/>.
- 131 <https://news.yahoo.com/housing-crisis-095502252.html> and <https://www.wsj.com/articles/apartment-evictions-are-mounting-in-houston-and-could-get-worse-11595583002>.
- 132 “Few CMBS Borrowers Receive Forbearance.” *Commercial Mortgage Alert*. July 31, 2020.
- 133 “COVID-19 and Distress in CMBS Markets.” Moody’s Analytics and CWC Capital. August 3, 2020.
- 134 “COVID-19 and Distress in CMBS Markets.” Moody’s Analytics and CWC Capital. August 3, 2020.
- 135 “Few CMBS Borrowers Receive Forbearance.” *Commercial Mortgage Alert*. July 31, 2020. Moreover, hedge funds and private equity firms also hold a small share of CRE mortgages. Anecdotal evidence indicates that they may be less willing to renegotiate the terms of these loans than banks. <https://www.nytimes.com/2020/08/13/business/commercial-landlord-loan-foreclosure.html>.

Report Summary Letter from Chairman Jay Clayton and Chief Economist S.P. Kothari



UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

Dear Reader,

This report examines the structure and function of the \$54 trillion U.S. credit markets with a focus on interconnections among various market segments. The report also discusses how those markets functioned in March 2020 in response to both the COVID-19-induced economic shock and the related monetary and fiscal policy responses. The principal purpose of the report is to identify key structural- and flow-related interdependencies in the U.S. credit markets as well as areas of stress revealed by the COVID-19 shock with an eye toward informing policymakers as we seek to improve the functioning and resilience of our financial markets.

We welcome comments on the report and have scheduled a conference to discuss the report for October 14th at 1:00 pm EDT. The conference will be live-streamed publicly.

Key takeaways from the report are:

- The U.S. credit markets, in size, structure and function have changed significantly since the 2008 Global Financial Crisis.
- The credit markets are highly interconnected which can both accelerate risk transmission and facilitate risk absorption.
- The broad stress in the short-term funding markets caused by the COVID-19 shock demonstrated that the ability and willingness of intermediaries (e.g., “market makers”) to absorb significant, rapid shifts in investor sentiment (e.g., a “dash for cash”) is limited in absolute terms and may become more limited as spreads widen and volatility increases during periods of stress and uncertainty.
- Due to the interconnected nature of our credit markets and the size and scope of the COVID-19 shock, it was insightful, prudent and, perhaps, essential that the actions of the Federal Reserve and the CARES Act were multi-faceted and immediate. Those actions were instrumental in ameliorating stress in the credit markets, particularly the short-term funding markets.
- The combination of the Federal Reserve’s intervention and the fiscal actions by the Treasury Department and Congress also was extremely important in stabilizing prices (e.g., housing prices) and sustaining economic activity (e.g., consumer spending), which in turn added stability to the credit markets.
- General economic and credit stresses from the initial and ongoing effects of the COVID-19 shock are still unfolding, and we must continue to monitor key market segments—e.g., corporate debt, municipal securities and commercial real estate (CRE)—both individually and as interconnected components of our financial system.

We look forward to your comments,

Handwritten signatures of Jay Clayton and S.P. Kothari in blue ink.

Jay Clayton and S.P. Kothari

Appendix

The diagrams in Figures 1.2, 2.1, 3.1, 4.2, 5.3, 6.1, and 7.2 represent snapshots of U.S. capital markets as of the end of 2019. The following sections describe the notation used in the diagrams and their data sources.

Diagram for the Overview of U.S. Credit Outstanding

In Figure 1.2, boxes represent entity types and connecting bands represent the transmission of credit risk between them. Ultimate borrowers (sources of credit risk, in red) are on the left, ultimate lenders (owners of credit risk, in green) are on the right, and financial intermediaries are in purple. Credit risk flows from left to right, capital flows from right to left, and the widths of the connecting bands are proportional to the stock of corresponding credit outstanding as of December 2019 (a \$1 trillion band is shown at bottom left for scale).

Diagrams for Individual Market Size and Interconnections

On the individual markets maps shown on Figures 2.1, 3.1, 4.2, 5.3, 6.1, and 7.2, boxes represent entity types and connecting banks represent the transmission of risk or other relationships between them. Credit risk flows from left to right, capital flows from right to left, and the widths of the connecting bands are proportional to the stock of corresponding credit outstanding as of December 2019 (on each map, a band is shown at bottom right for scale). The sizes of the boxes are not proportional to balance sheet or any other measure, and are determined only by aesthetics. Where possible, the dollar sizes of boxes or connections are labeled on the maps (smaller connections are generally not labeled). Labels with the tilde sign (~) are less precise estimates of quantities.

Generally, borrowers are on the left side of each map and lenders are on the right. The color of the border around each market participant type communicates the major types of risk embedded in that type. Red is for high leverage, yellow is for maturity and liquidity transformations, black is for credit risk transformation (e.g., tranching, assumption of credit risk), and purple is for market concentration. Some entities might have multicolored borders indicating more than one embedded risk.

Generally, solid green connecting bands represent connections due to on-balance-sheet risk, solid red bands represent derivatives and repo exposures, double solid lines represent flow (transactional) connections, and dashed lines represent connections to reference assets for derivatives and repos and indirect credit risk exposures through insurance or guarantees. Some connections are labeled for ease of interpretation.

Institutions with small net positions in each market are omitted for simplicity, and links between institutions of the same type are also generally left out.

Data Sources

The primary data source for these figures is the Financial Accounts of the United States (Z.1)¹³⁶ complemented with data from a variety of other data sources: NY Federal Reserve Primary Dealer Statistics (broker-dealers holdings), NAIC reports and AM Best data (insurance companies), the 2020 ICI Investment Company Fact Book and Morningstar (RICs), FDIC Bank Data and Statistics and Form Y-9 filings (bank holdings and loan portfolio), Mergent FISD (corporate bonds), Refinitiv DataScope (credit ratings), Moody's CLO database (CLO portfolio holdings and issued securities), Fannie Mae, Freddie Mac, and FHLB websites (GSE-related variables), Form N-MFP filings (MMFs), Form PF filings (hedge funds), and DTCC TIW (CDS). Estimates of some quantities were adjusted to align values from different data sources.

¹³⁶ <https://www.federalreserve.gov/releases/z1/default.htm>.



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