

## INTERCONNECTING THE DOTS

### Chapter 2 at a Glance

- High-yield bond, leveraged loan, and private debt markets have grown significantly over the past decade and have become more complex.
- Key vulnerabilities include weaker credit quality of borrowers, looser underwriting standards, liquidity risks at investment funds, and increased interconnectedness.
- On the positive side, use of financial leverage by investors and direct exposures of banks have declined.
- In a severe adverse scenario, total losses at nonbank financial institutions could be substantial, while risk to the banking sector appears to be lower.

*Risky corporate credit markets have expanded rapidly since the global financial crisis. The role of nonbank financial institutions has increased, and the system has become more complex and opaque. This chapter maps out the financial ecosystem of these markets and identifies potential vulnerabilities, which include weaker credit quality of borrowers, looser underwriting standards, liquidity risks at investment funds, and increased interconnectedness. On the positive side, the use of financial leverage by investors and direct exposures of banks—which were crucial amplifiers during the global financial crisis—have declined. Run risks have lessened in some segments because of a prevalence of long-term locked-in capital in the private debt and collateralized loan obligation (CLO) markets. In an illustrative severe adverse scenario, losses on risky credit exposures at banks are estimated to be manageable, in aggregate, although losses at a few large banks could be substantial. However, losses at nonbank financial institutions could be high. Given the now-limited role played by banks, this could impair credit provision in these markets and make a recession more severe. The coronavirus (COVID-19) crisis, which has resulted in price declines in risky credit markets of about two-thirds of the severity of the global financial crisis through late March (before reversing a portion of these declines), could further expose the vulnerabilities highlighted in this*

*chapter. Policymakers should now act decisively to contain the economic fallout of COVID-19 and support the flow of credit to firms. Once the crisis is over, they should assess the sources of market dislocations and tackle the vulnerabilities that have been unmasked by this episode.*

### Rapid Growth of Risky Credit Has Raised Red Flags

Corporate debt has been rising steadily over the past decade, leading to a weakening of corporate credit quality (see the October 2019 *Global Financial Stability Report* [GFSR]). This chapter, which focuses on the risky segments of credit markets (high-yield bonds, leveraged loans,<sup>1</sup> and private debt) aims to map out the financial ecosystem (the investor base and linkages between banks and nonbank financial institutions) and identify key vulnerabilities. It also explores key risk transmission channels and the extent of potential credit and mark-to-market losses that financial institutions could be exposed to under a severe adverse scenario.

As discussed in Chapter 1, market conditions in the risky credit markets have deteriorated sharply since the COVID-19 outbreak. By late March, US and Euro-

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<sup>1</sup>Leveraged loans refer to speculative-grade loans based on their credit rating or credit quality ratios, such as net-debt-to-earnings, debt-to-assets, or debt-to-equity ratio. Leveraged loans are predominantly syndicated—that is, several (a syndicate of) lenders participate in the issuance of a loan.

pean markets for high-yield bonds and leveraged loans had experienced market declines of nearly two-thirds of the falls seen during the global financial crisis, as investors grew concerned about the deterioration of the economic outlook. Liquidity deteriorated significantly, with exceptionally high bid-ask spreads—a development that likely amplified asset price moves. Meanwhile, reflecting expectations of a worsening of firms’ fundamentals, ratings agencies increased their forecasts of speculative-grade defaults to recessionary levels. Since late March, however, credit spreads have retraced a portion of their earlier widening and bid-ask spreads have largely normalized, owing to rapid and bold policy responses by major central banks and governments (see “Policy Priorities” section in Chapter 1). Nonetheless, earnings forecasts have continued to decline, and credit rating downgrades have gained momentum in risky credit markets.

Risky credit markets have grown rapidly over the past decade, supported by investor search for yield and favorable borrowing terms for firms. This rapid expansion has attracted the attention of regulators and market observers. Furthermore, nonbank financial institutions have become increasingly important players in credit markets in advanced economies, though their behavior over the full credit cycle has not been tested yet. Recent studies by international organizations and national supervisors have focused on the size, riskiness, and investor base in some of these markets.<sup>2</sup>

One area of risky credit markets—leveraged loans—has grown particularly rapidly since the global financial crisis. Issuance of floating-rate institutional leveraged loans moderated in 2019 due to reduced investor demand for floating-rate instruments in an environment of declining interest rates. After a brief surge early this year, issuance of leveraged loans slowed sharply following the COVID-19 outbreak (Figure 2.1, panel 1). High-yield bond issuance has also fallen from the high levels early this year during the COVID-19 outbreak, but it appears to have recovered somewhat in April.

On net, global leveraged loans outstanding grew through the end of 2019 (especially in the United States), reaching \$5 trillion globally, of which \$4 trillion was in advanced economies (Figure 2.1, panel 2). In addition, the formation of new CLOs remained

robust before the most recent COVID-19–related slowdown, partly ameliorating the decline in demand from interest-rate-sensitive investors (Figure 2.1, panel 3).<sup>3</sup> CLOs outstanding more than doubled since 2010 (Figure 2.1, panel 4), driven by activity in the United States. Reportedly, investors have been attracted by the benefits of risk diversification, more resilient structures since the global financial crisis, funding stability, and transparency to investors.

The high-yield bond market had also grown significantly by the end of 2019, climbing to \$2.5 trillion globally, of which \$2 trillion was in advanced economies. Growth was faster in Europe than in North America in recent years (Figure 2.1, panel 5).

Finally, the private debt market also boomed, reaching nearly \$1 trillion (Figure 2.1, panel 6).<sup>4</sup> This growth in private debt is part of a secular trend away from public markets, which first started in equity markets. In addition, the search for yield in the low-interest-rate environment by investors that have long investment horizons and are not subject to mark-to-market requirements—and may therefore be willing to give up liquidity to reach a higher yield target—has reinforced this trend.

## The Credit Ecosystem Has Become More Complex

Banks’ direct exposures to credit risk have declined as banks have shifted from an originate-to-retain to an originate-to-distribute business model. A broadening of the investor base beyond banks over the past few decades has contributed to the distribution of exposures to a wider set of creditors with varying risk profiles. This has likely reduced some risks to the banking system, but it has also increased the complexity and opacity of credit markets, possibly introducing new risks and shock transmission channels.

Mutual funds and exchange-traded funds (ETFs) play a key role in the US high-yield bond market, while CLOs and banks account for a large share of leveraged loan holdings globally (Figure 2.2, panels 1 and 2). In the US market, banks are exposed to CLOs primarily through AAA tranches. Asset managers and

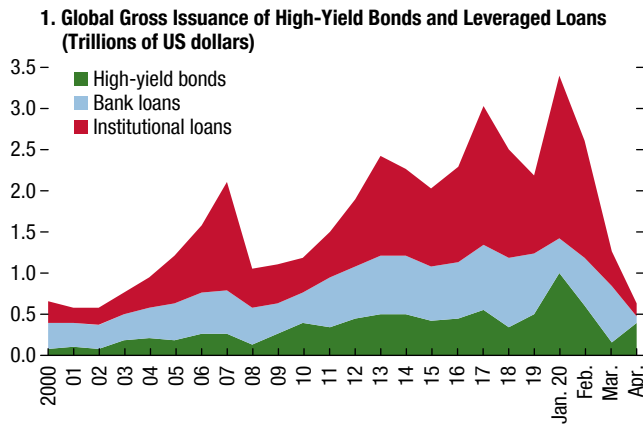
<sup>3</sup>A collateralized loan obligation is a structured finance product collateralized predominantly by broadly syndicated leveraged loans.

<sup>4</sup>Private debt refers to financing that is directly negotiated, typically between a nonbank lender and a borrower without the involvement of a syndicate bank.

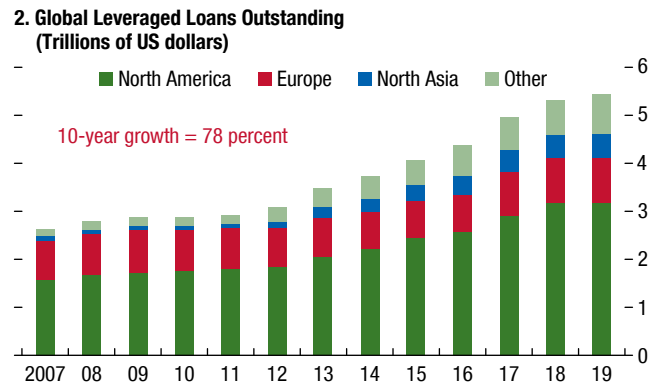
<sup>2</sup>See the April 2018, April 2019, and October 2019 GFSR; Bank of England 2019; ECB 2019; FSB 2019; IOSCO 2018; and IOSCO 2020.

**Figure 2.1. Market Developments: Issuance and Size**

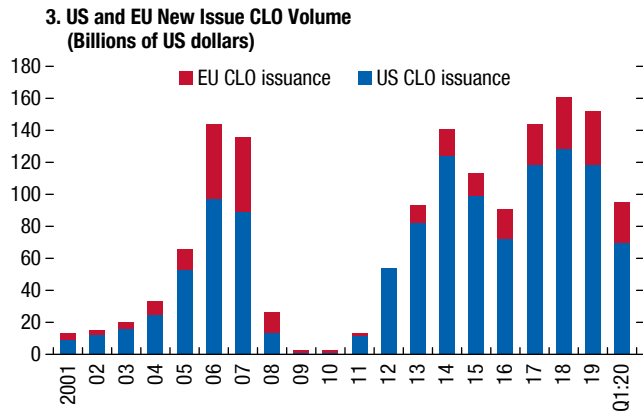
Issuance of risky credit was strong before the COVID-19 outbreak, but has slowed sharply since late February.



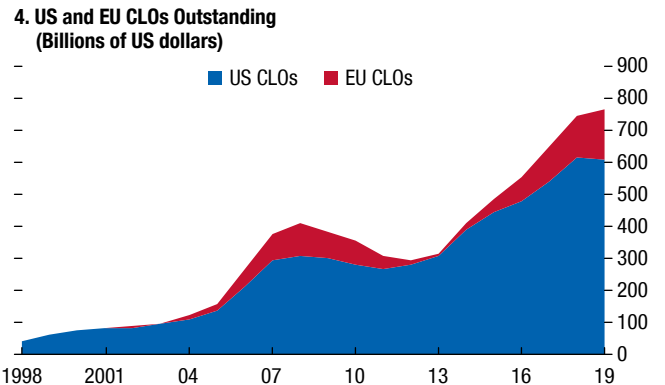
On net, the leveraged loan market grew through the end of 2019 to \$5 trillion globally, \$4 trillion of which was in advanced economies.



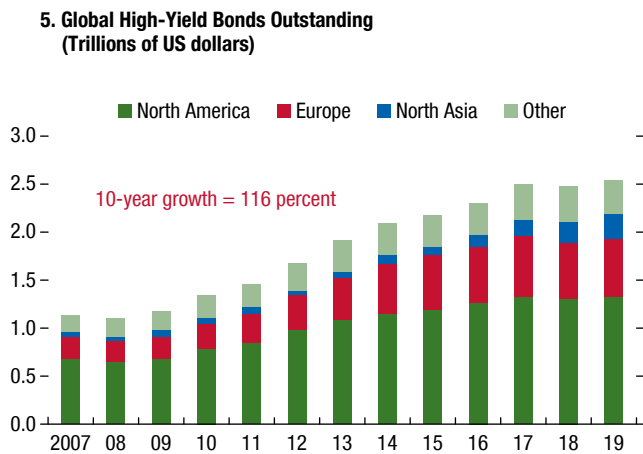
Issuance of CLOs remained robust before the COVID-19 outbreak, but declined sharply thereafter.



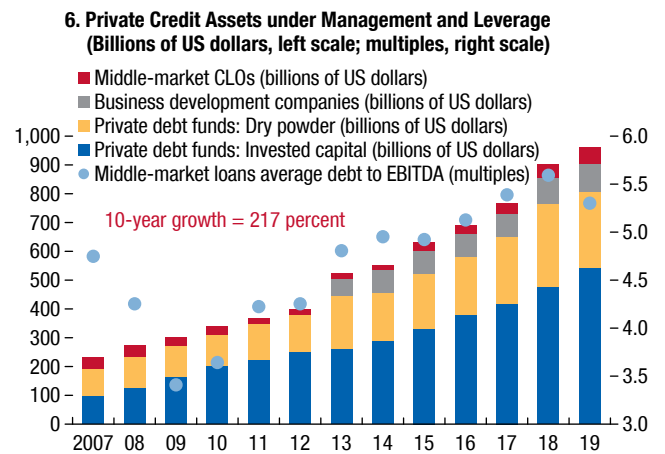
CLO volume surged through 2019, providing risk diversification and credit protection for investors in the leveraged loan market.



The high-yield bond market had climbed to \$2.5 trillion globally by the end of 2019, benefiting from falling interest rates.



The private debt market also boomed on the back of demand from institutional investors seeking long-term investments.



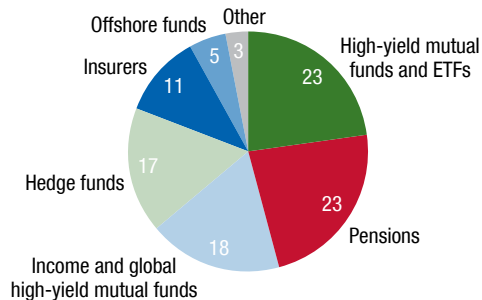
Sources: Bank of America Merrill Lynch; Dealogic; S&P Leveraged Commentary and Data; Securities Industry and Financial Markets Association; Preqin; Association for Financial Markets in Europe; and IMF staff calculations.

Note: In panel 1, monthly data are annualized. In panel 3, the estimate for 2020 is annualized Q1 data. In panels 2 and 5, Europe refers to the European Union and the United Kingdom; North America refers to Canada and the United States; and North Asia refers to China, Japan, and South Korea. In panel 6, dry powder refers to capital that has been committed but not yet invested. Middle market refers to firms with earnings below \$50 million. CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; EU = European Union.

**Figure 2.2. Investors in Risky Credit Markets**

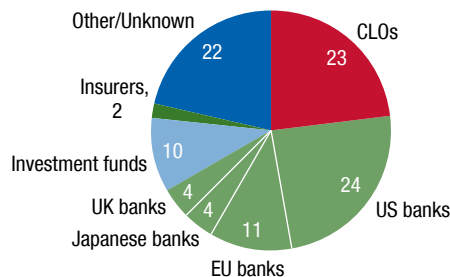
High-yield dedicated and multisector investment funds hold almost half of the high-yield bond market ...

**1. US High-Yield Bond Investor Base (Percent, as of 2019)**



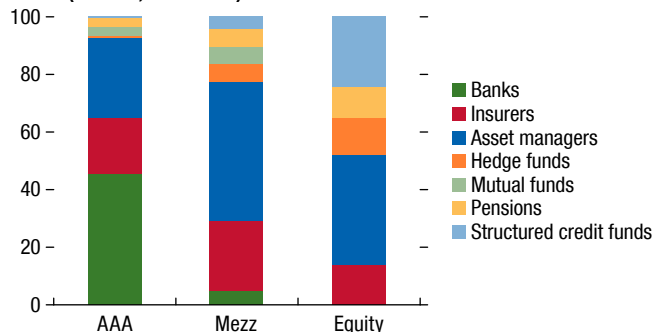
... while, globally, banks are the largest holders of leveraged loans.

**2. Global Holders of Leveraged Loans (Percent, as of 2018)**



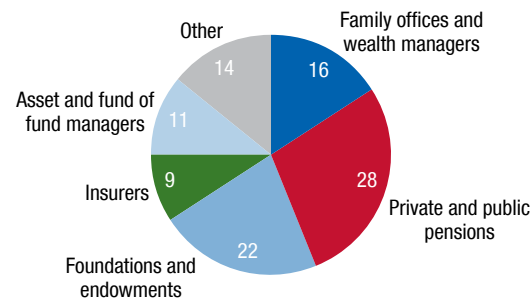
Asset managers and hedge funds are most exposed to riskier tranches of CLOs.

**3. US CLO Investor Base (Percent, as of 2019)**



Pension funds are the largest investors in private debt vehicles.

**4. Institutional Investors in US Private Debt Funds, by Type (Percent, as of 2019)**



Sources: Barclays Capital; Citigroup; Financial Stability Board; Moody's; Preqin; S&P Leveraged Commentary and Data; and IMF staff calculations.

Note: For panel 2, the Other/Unknown category is based on estimates from the Financial Stability Board and includes other financial and nonfinancial US organizations based on Treasury International Capital data. CLO = collateralized loan obligation; ETFs = exchange-traded funds; EU = European Union; Mezz = mezzanine.

insurance companies, by contrast, invest across the capital structure. Investors in the CLO equity and mezzanine debt tranches are a more diverse group, also comprising hedge funds and other structured credit funds (Figure 2.2, panel 3). In the US private debt market, growth has been partly driven by institutional investors with long-term locked-in capital who are not required to mark their positions to current market prices (Figure 2.2, panel 4). This has reduced liquidity risks, albeit at the expense of increasing the opacity of the market.

Figure 2.3 provides a visualization of the global ecosystem of risky credit markets:

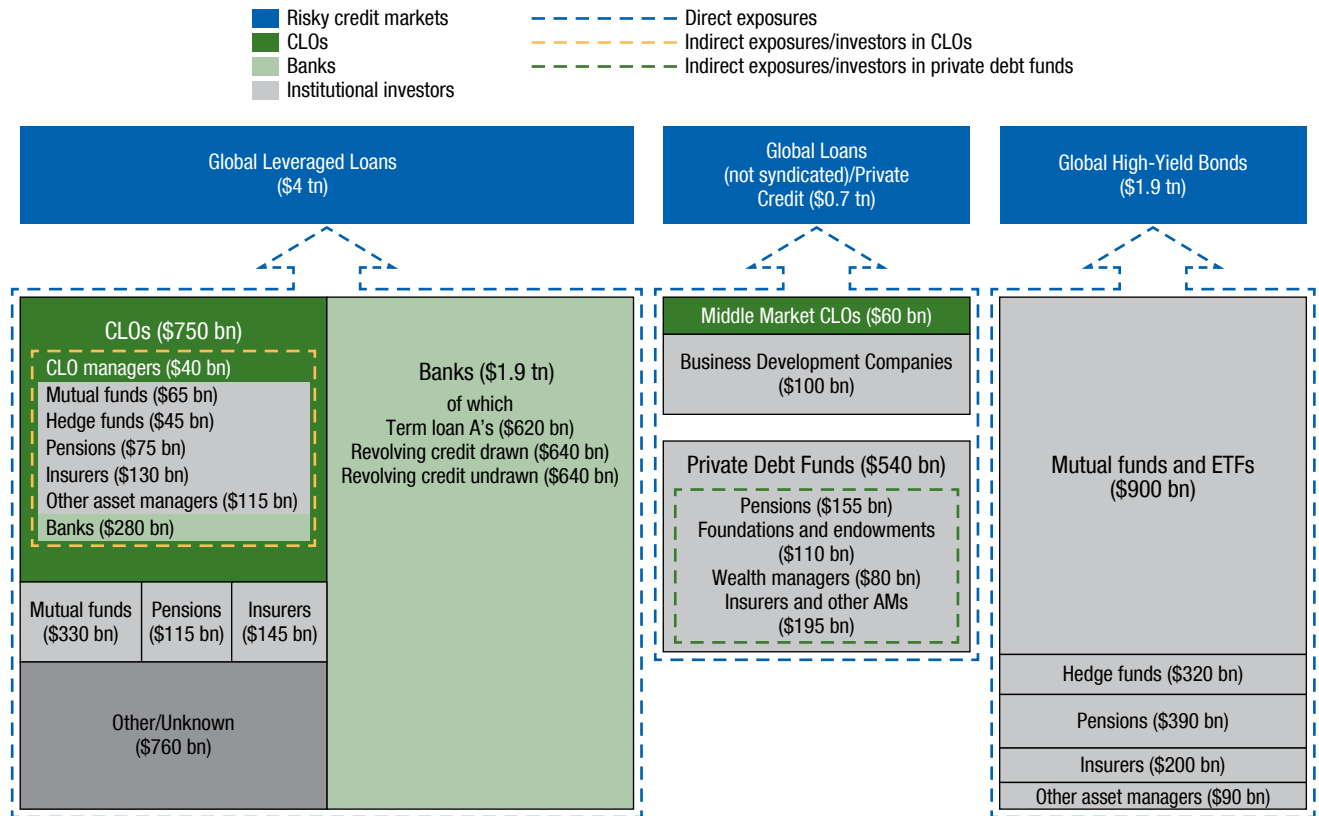
- *Banks remain vital to the functioning of risky credit markets*, where they provide senior secured loans and credit lines. Before the market stress surround-

ing the COVID-19 outbreak, half of bank credit lines were estimated to be undrawn, but companies have more recently been looking to shore up cash positions by calling on the capacity of credit lines (see Chapter 1). The undrawn credit lines may help absorb some of the refinancing pressures in a market downturn (if covenants are not breached) but can also increase credit and liquidity risk at banks. Banks also have indirect exposures through CLOs and various forms of financing and leverage.

- *CLOs hold about one-quarter of global leveraged loans and are the largest investor in the institutional leveraged loan market*, accounting for more than 60 percent of institutional loans outstanding. CLOs benefit from stable funding sources in the form of long-term locked-in capital, so run risk related to

Figure 2.3. Ecosystem of Global Risky Credit Markets

Direct and Indirect Exposure to Advanced Economy Risky Credit Markets (US dollars)



Sources: Bloomberg Finance L.P.; Financial Stability Board; S&P Leveraged Commentary and Data; and IMF staff calculations. Note: The estimates for the global high-yield bond investors is based on the percentage allocated for the US high-yield bond investor base in Figure 2.2, panel 1, and applied to global high-yield bonds outstanding. The estimate for private debt funds excludes uninvested capital, also known as dry powder. Numbers are rounded to \$5 billion. AMs = asset managers; bn = billion; CLOs = collateralized loan obligations; ETFs = exchange-traded funds; tn = trillion.

maturity mismatches is limited. They also provide steady demand for loans, particularly during the reinvestment period, when CLO managers can actively manage their portfolios. CLOs generally face pressure when the share of assets rated CCC or below increases, or when they are failing key over-collateralization tests put in place to protect senior noteholders.<sup>5</sup>

- *Mutual funds and ETFs are important players in global risky credit markets.* Investment funds and ETFs account for about half of the demand for

<sup>5</sup>An overcollateralization test measures the ratio of the aggregate principal value of pooled assets to the outstanding debt tranches that comprise the CLO capital structure. A typical overcollateralization test ranges by tranche, and thresholds are usually between 5 percent and 20 percent.

high-yield bonds; these funds have also supported strong growth in the leveraged loan market. Open-ended investment funds may face liquidity mismatches, often offering investors daily redemption, despite the relatively illiquid nature of the underlying instruments.

- *Main nonbank lenders in private debt markets are private credit funds, business development companies, and middle-market CLOs.* Unlike banks, these vehicles typically do not carry maturity or asset-liability mismatches and appear to employ limited financial leverage. Such leverage is provided by banks in the form of credit lines and capital call lines.<sup>6</sup> Private

<sup>6</sup>A capital call line is a line of credit typically provided by a bank to a private equity firm. It can be used to enhance debt fund returns or provide bridge financing for limited partnership capital.

credit funds also have large amounts of capital that have been committed but not yet invested—so-called dry powder—that can be sourced and put to work in a downturn.

- Estimates of indirect exposures suggest that international banks, including large banks in advanced Asia, hold about one-third of global CLOs. Insurance companies have become the second-largest CLO buyer. For private debt funds, the primary source of capital appears to come from institutional investors, such as global private and public pension funds, foundations, and endowments.

### Vulnerabilities in Risky Credit Markets Have Grown

The main vulnerabilities in global risky credit markets are highlighted in Table 2.1, which is based on the GFSR indicator-based framework (see Online Annex 1.1 of the April 2019 GFSR)<sup>7</sup> and discussions with market participants. These vulnerabilities include weaker credit quality of borrowers, looser underwriting standards, eroded investor protections, liquidity risk in investment funds, and higher concentration of lenders within a lender type, as well as a high degree of interconnectedness in the ecosystem. The complexity and opacity of credit markets have also increased, particularly in the private debt market. On the positive side, financial leverage and direct exposures of banks—which were crucial amplifiers during the global financial crisis—have declined, and run risk has diminished because of a prevalence of long-term locked-in capital in the CLO and private debt markets. These vulnerabilities are explored by type in the discussion that follows.

### Increased Borrower Leverage

The combination of increased borrower leverage and weaker earnings has uniquely exposed risky credit markets to the COVID-19 shock (Figure 2.4, panel 1). The share of highly leveraged deals in the United States has risen more rapidly for deals financed by nonbank financial institutions than for those with loans held by banks. Leverage is also higher for smaller companies than for larger firms. Finally, deals sponsored by private equity firms—typically to fund leveraged buyouts

or mergers and acquisitions—have increased considerably faster in terms of leverage multiples.

In addition, leverage in the US loan market appears to be underestimated because of significant earnings adjustments (Figure 2.4, panel 2) and inflated goodwill (see the October 2019 GFSR). This issue is widely recognized by market participants, who are said to perceive potential repricing associated with unrealized earnings addbacks as a key risk. Moreover, despite very low interest rates, interest coverage ratios have continued to decline steadily (Figure 2.4, panel 3), particularly for smaller, middle-market firms (firms with earnings below \$50 million). Finally, underwriting standards and investor protections have deteriorated in recent years in both the high-yield and leveraged loan market, as summarized by weaker covenants and thinner loss-absorbing buffers of loans (Figure 2.4, panels 4 and 5). As a result, recovery values for leveraged loans in the event of default may be lower in this economic downturn. More recently, since the COVID-19 outbreak, the primary market for risky credit has reportedly become more disciplined, with higher spreads, more protections, and less leverage, as lenders have apparently applied more conservative underwriting standards.

### Decreased Financial Leverage

The deterioration in ratings quality in leveraged loan markets, including the expansion of B-rated credit, has been more pronounced during the current long credit cycle (Figure 2.5, panel 1). As a result, risk ratings for CLOs have also deteriorated (Figure 2.5, panel 2). However, compared with the CLO structures that prevailed before the global financial crisis, current CLOs have less “embedded” leverage—that is, they have a higher share of equity and mezzanine debt (rated A and below) as a cushion intended to protect AAA tranche holders (Figure 2.5, panel 3). This implies that investors in AAA tranches are less likely to suffer credit losses, even in a severe market downturn, as was the case during the global financial crisis. By contrast, equity and mezzanine debt investors may experience credit losses, as shown in a simulation based on a typical CLO (Figure 2.5, panel 4).

During the global financial crisis, one of the key amplifiers was financial leverage—that is, the leveraging-up of risk positions through the use of derivatives, repurchase agreements, and bank lines of

<sup>7</sup>All annexes are available at [www.imf.org/en/Publications/GFSR](http://www.imf.org/en/Publications/GFSR).

**Table 2.1. Key Vulnerabilities in Risky Credit Markets**

Vulnerability Type								
	Size	Valuations	Borrower's Leverage	Embedded and Financial Leverage	Liquidity, Maturity, FX Mismatches	Concentration	Interconnectedness	Complexity and Opacity
High-Yield Bond Market	\$1.9 trillion	High valuations before the COVID-19 outbreak	<ul style="list-style-type: none"> <li>• High firm leverage</li> <li>• EBITDA add-backs</li> <li>• Large share of B credit</li> <li>• LBO activity</li> </ul>	Active CDX market	Fund outflows can be sizable	Top borrowers represent a sizable share of the market	<ul style="list-style-type: none"> <li>• Borrowers in both HY and LL markets</li> <li>• Correlations of HY and LL credit</li> <li>• Crossover funds' investments in both HY and LL</li> </ul>	Low transparency of the riskiness of investors' exposures
Leveraged Loan Market	\$4.0 trillion			Capital call lines of credit		Large locked-in capital and HTM positions		
Private Debt Market	\$0.7 trillion			<ul style="list-style-type: none"> <li>• Limited data on prices</li> <li>• High return targets</li> </ul>	Lenders in both LL and PD markets	Low visibility of borrowers, investors, and transactions		

Sources: Bloomberg Finance L.P.; Dealogic; and IMF staff calculations.

Note: "Complexity and Opacity" refers to a lack of data on prices, transactions, and investor positions in some areas of risky credit markets. CDS = credit default swap; CDX = credit default swap index; CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; FX = foreign exchange; HTM = held to maturity; HY = high-yield; LBO = leveraged buyout; LL = leveraged loan; PD = private debt; repo = repurchase; TRS = total return swap.

credit. Since then, the use of financial leverage appears to have declined significantly in the United States. For example, the use of repurchase transactions to fund CLO AAA tranches is reportedly limited. Similarly, investors do not appear to widely employ total-return swaps to gain leveraged exposure to the loan market. Banks also appear to be more conservative when it comes to the amount of underwritten risk in new loans they will hold—so-called pipeline risk. Finally, CLO warehouse lines (lines of credit to finance new CLO formation) now often assign the portfolio manager or third parties to take first-loss risks, not the banks (Figure 2.5, panel 5).

Overall, banks appear to have cut some of their indirect exposure through financial leverage, likely reducing the potential for an amplification of price moves during periods of stress. However, interconnectedness between banks and other financial institutions may be increasing. For example, bank lending to nonbank financial institutions has nearly doubled since 2013, reaching \$1.4 trillion in the United States (Figure 2.5, panel 6).

### Refinancing and Liquidity Risks

While refinancing risks for high-yield bonds and leveraged loans seem manageable in the short term, their maturity profile appears more challenging over the medium term, with a record amount of loans matur-

ing in five years (Figure 2.6, panel 1). In addition, maturing debt is concentrated in lower-rated loans (Figure 2.6, panel 2), raising the specter of possible downgrades and defaults in this economic downturn.

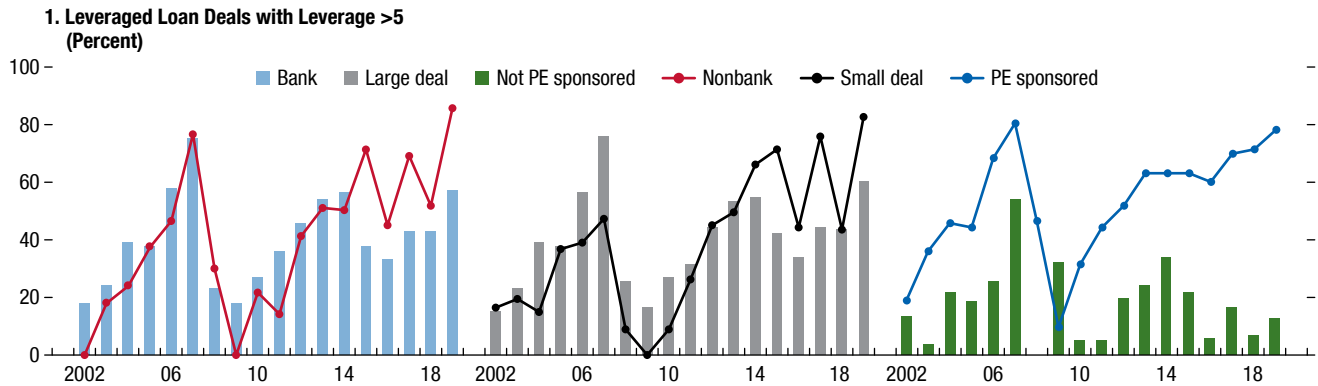
As fixed-income funds with relatively illiquid holdings have grown significantly over the past decade, large withdrawals may contribute to asset price moves and deteriorating liquidity conditions, especially for funds not managing liquidity risk properly. In addition, fund outflows appear to have become more volatile (Figure 2.6, panel 3). For example, US open-ended high-yield bond and leveraged loan funds experienced \$42 billion in outflows in the fourth quarter of 2018, when financial conditions tightened markedly. While these funds were able to meet redemptions without severe dislocations to market functioning, reflecting varying strategies of liquidity management across funds and sufficient liquidity buffers in aggregate, the fourth quarter of 2018 stress episode was short-lived and took place against a backdrop of continued growth (Figure 2.6, panel 4).<sup>8</sup>

So far, between late February and the end of March 2020, US open-ended high-yield bond and leveraged loan funds have experienced \$34 billion in outflows. While more recently high-yield bond funds have seen

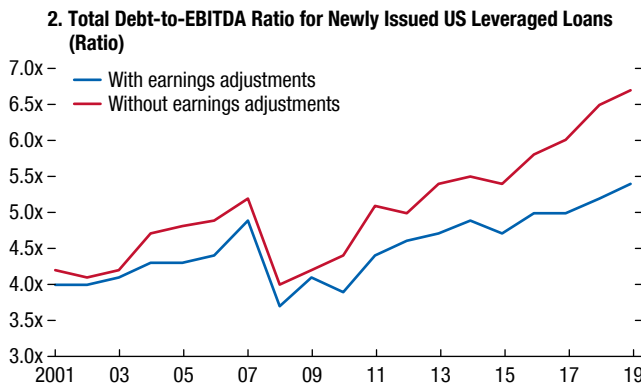
<sup>8</sup>According to Emerging Portfolio Fund Research data, cumulative fourth-quarter 2018 outflows from US high-yield bond funds accounted for 7 percent of assets under management, while outflows from US loan funds totaled 12 percent of assets under management.

**Figure 2.4. Balance Sheet Leverage and Credit Risk**

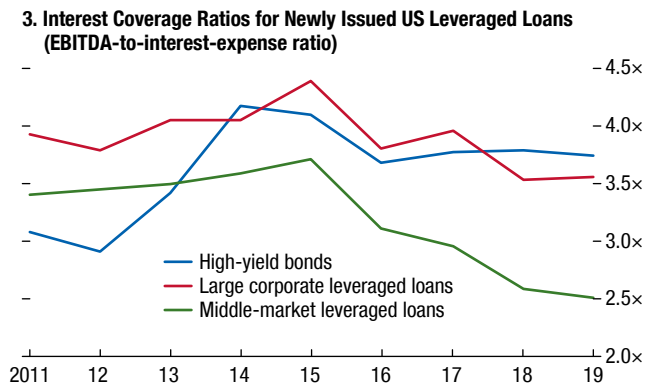
Leverage has risen in the loan market, primarily for deals financed by nonbank financial institutions, smaller deals, and private equity-sponsored transactions.



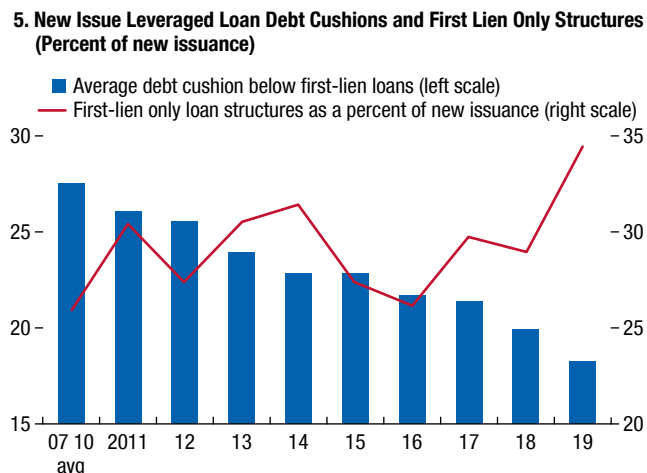
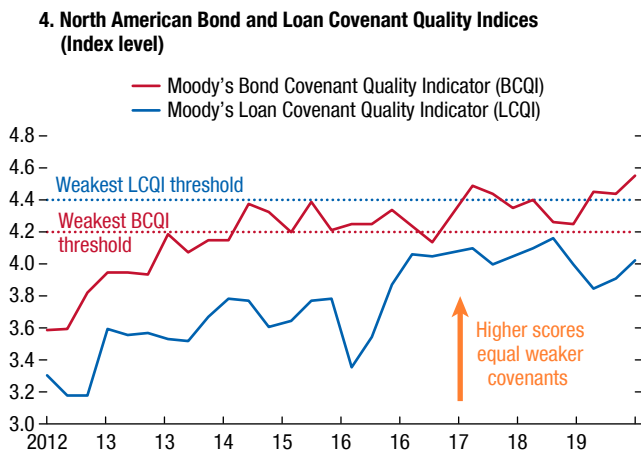
Leverage in the loan market may be understated because of significant earnings adjustments ...



... while debt-service ability has steadily weakened since 2015, particularly in middle-market firms.



In this economic downturn, recovery values may be lower because of weaker covenants and reduced loss absorption capacity in the leveraged loan market.

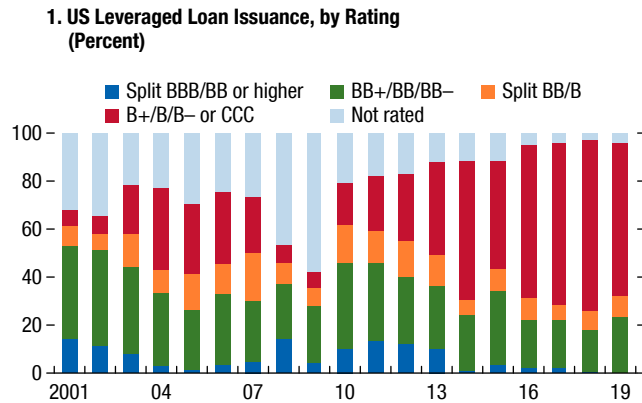


Sources: Bank of America Merrill Lynch; Moody's; S&P Leveraged Commentary and Data; and IMF staff calculations.  
 Note: In panel 2, the EBITDA for US leveraged loans is adjusted by adding back projected cost savings from restructuring, synergies, transaction costs, management fees, and nonrecurring operating expenses to compute the average total debt-to-EBITDA for loan deals without EBITDA addbacks. In panel 4, North America refers to Canada and the United States. The weakest threshold for the BCQI and LCQI refers to the level at which a CQI score would enter the fifth (CQ5) or weakest range of the index score that ranges between 0 and 5. The covenant quality score reflects the overall level of covenant protection based on a five-level scale of covenant quality ranging from CQ1 (strong) to CQ5 (weakest). Avg = average; EBITDA = earnings before interest, taxes, depreciation, and amortization; PE = private equity.

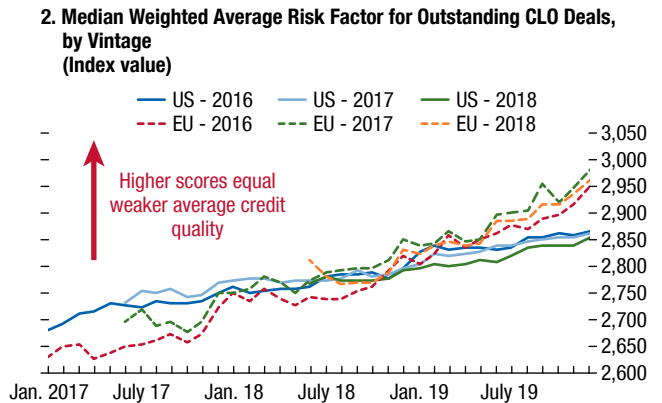


**Figure 2.5. Embedded and Financial Leverage**

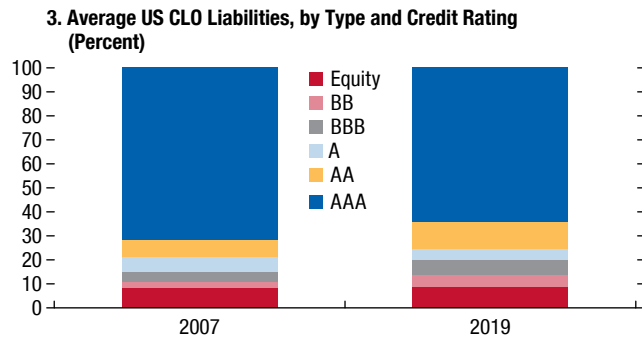
A growing concentration of lower-rated credit has raised the potential impact of rating downgrades ...



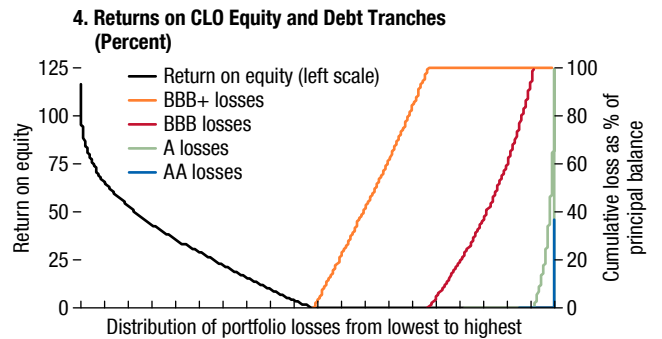
... and has already translated into a deterioration in risk ratings for CLOs.



New CLOs have a larger equity cushion than precrisis CLOs ...



... but it can erode quickly, bringing in losses to equity holders and even investors holding lower-rated debt.



Financial leverage appears to have declined significantly since the global financial crisis ...

**5. Estimated Lines of Credit and Derivatives in US Leveraged Loan Markets**

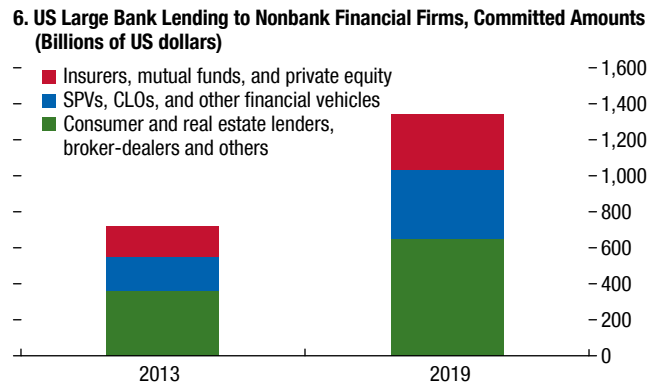
Loan Pipeline or Bridge Risk Is Lower	Risk Management Has Improved for CLO Warehouses
<b>Total Loans and Bonds</b>	<b>CLO Warehouses</b>
2007 \$330 billion	2007 \$40–50 billion
Today ~\$50 billion	Today \$15 billion

**Less Investor Leverage in the Loan Market**

Total Return Swap Lines	Total	Leverage
2007	\$250 billion	8–10×
Today	~<\$75 billion	~3–4×

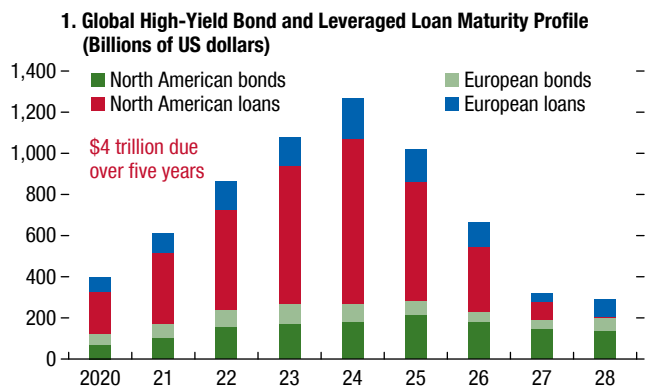
... but banks have increased their exposures to nonbank lenders.



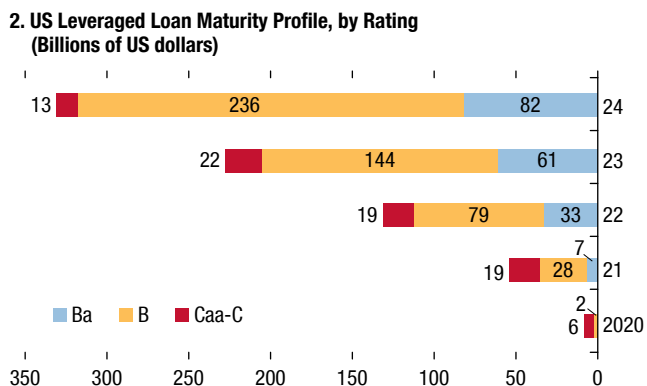
Sources: Barclays Capital; Citigroup; Federal Reserve; JPMorgan Chase & Co; Moody's; S&P Leveraged Commentary and Data; and IMF staff calculations. Note: For panel 2, the weighted average risk factor (WARF) is the weighted average of the ratings for each loan in the portfolio, where a higher WARF score reflects a weaker weighted average credit strength. For panel 4, the estimation is based on a Monte Carlo simulation of a representative CLO. For individual loans in the portfolio, their expected default rate is dispersed around the expected default rate associated with each credit rating. The Monte Carlo simulation is run 10,000 times assuming varying levels of such dispersion. The portfolio consists of 100 senior secured first lien loans, with an adjusted weighted average life of 4.894 years, a weighted average rating of B, and an expected portfolio default rate of 15.9 percent. On the liability side, the CLO has an equity tranche equivalent to 11.8 percent of liabilities. The liability structure further consists of: A-1 notes (rated AAA and par amount equal to 60.5 percent of liabilities); A-2 notes (rated AA and par amount equal to 11.5 percent of liabilities); a B tranche (rated A and par amount equal to 6.4 percent of liabilities); a C tranche (rated BBB and par amount equal to 6.4 percent of liabilities); and a D tranche (rated BB and par amount equal to 3.4 percent of liabilities). Yields on loans and CLO tranches are derived from JPMorgan market rates. Probabilities of default and assumed recovery values are from S&P historical values. The Monte Carlo simulation is run using S&P's Global CDO Evaluator v 8.1 and employing default settings. In panel 5, bridge risk refers to short-term financing provided by banks to leveraged loan issuers that could be at risk for repayment if investor appetite, liquidity, or market demand significantly declines during the period of temporary financing. For panel 5, numbers are based on estimates provided by JPMorgan Chase & Co. CLOs = collateralized loan obligations; EU = European Union; SPVs = special purpose vehicles.

**Figure 2.6. Maturity and Liquidity Mismatches**

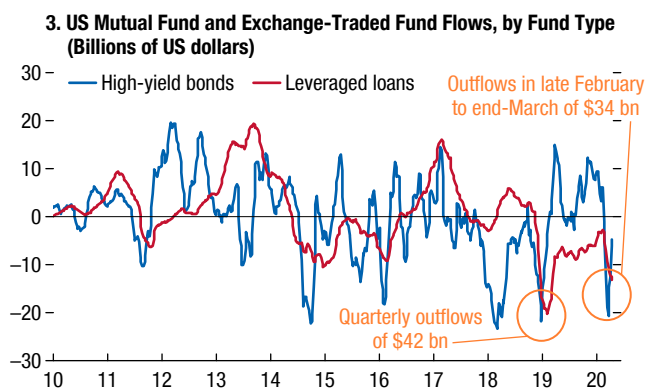
A substantial amount of high-yield bonds and leveraged loans will mature over the next five years ...



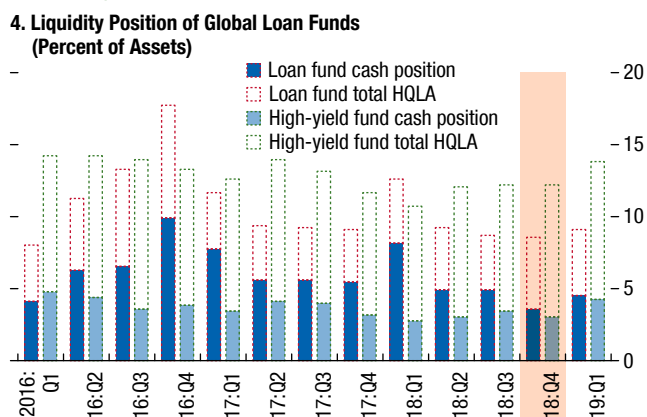
... and a significant portion of maturing loans is accounted for by companies rated single-B and lower.



Recent episodes of market stress showed that outflows can be sizable ...



... though liquidity buffers proved to be sufficient, on aggregate, in the 2018:Q4 episode.



Sources: EPFR Global; Moody's; Morningstar; S&P Leveraged Commentary and Data; and IMF staff calculations. Note: In panel 1, Europe refers to the European Union and the United Kingdom; North America refers to Canada and the United States. Bn = billion; ETFs = exchange-traded funds; HQLA = high-quality liquid assets.

inflows, and outflows from leveraged loans have slowed markedly—reflecting both institutional investors' quarter-end portfolio rebalancing and renewed demand for exposure to risky credit markets—longer-lasting episodes of market distress, especially if accompanied by a recession, may lead to more severe liquidity strains in the future.

**Concentration Risk and Interconnectedness**

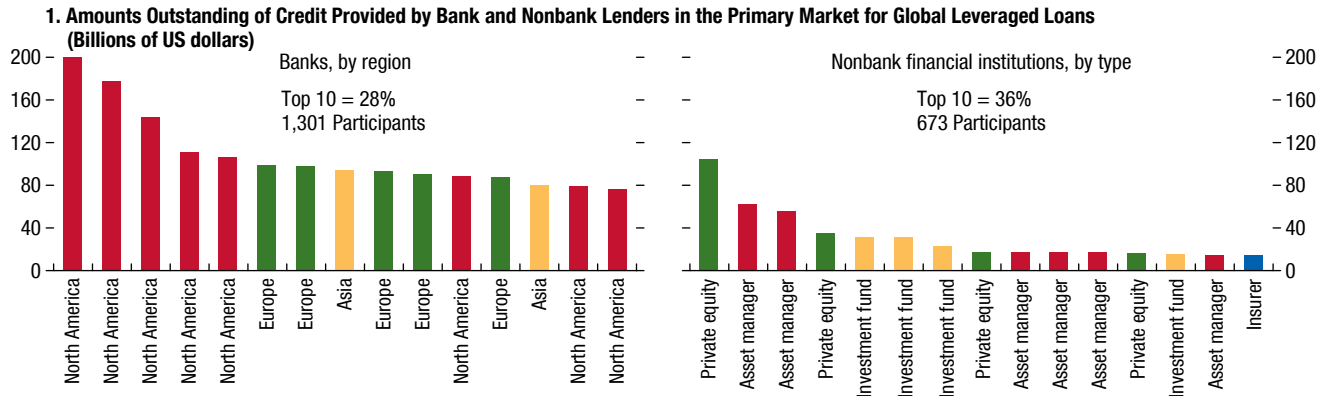
Concentration risk in risky credit markets is significant and may accelerate adverse asset price market moves should key participants decide to exit the markets. In the primary market for leveraged loans, exposures are concentrated among a few large global

banks and nonbank financial institutions (Figure 2.7, panel 1). Similarly, in the secondary markets for speculative-grade credit (which includes leveraged loans and high-yield bonds) and for CLOs, several large banks account for significant portions of these markets (Figure 2.7, panel 2).<sup>9</sup> Large non-US banks are heavily involved, have higher sensitivity to rating downgrades because of steeper capital charges under the new Basel securitization framework, and are more exposed to changes in hedging costs. In the US high-yield bond market, large investment funds can have sizable

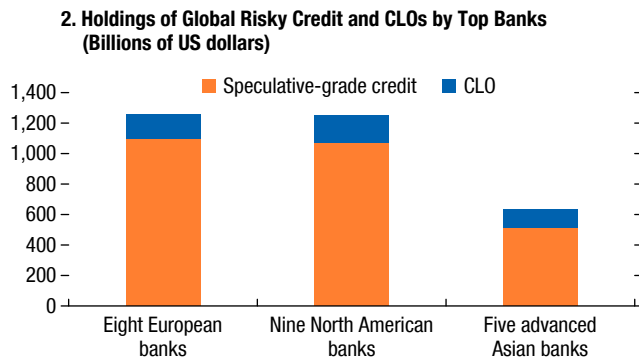
<sup>9</sup>Speculative-grade credit exposures in Figure 2.7, panel 2, are estimated by using individual institutions' Pillar 3 disclosures and, thus, include leveraged loans and high-yield bonds, as well as some small- and medium-sized-enterprise loans and some emerging market loans.

**Figure 2.7. Concentration and Interconnectedness**

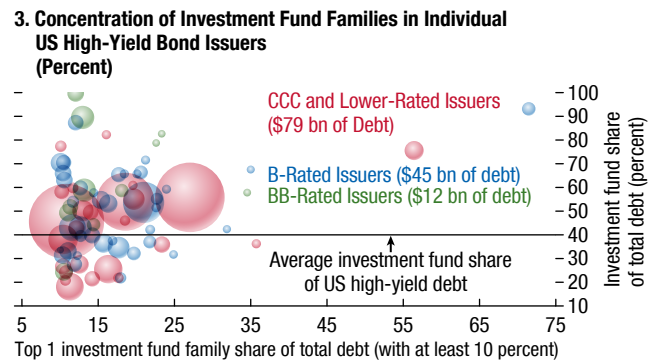
Top banks and nonbank financial institutions account for a large share of the primary loan market.



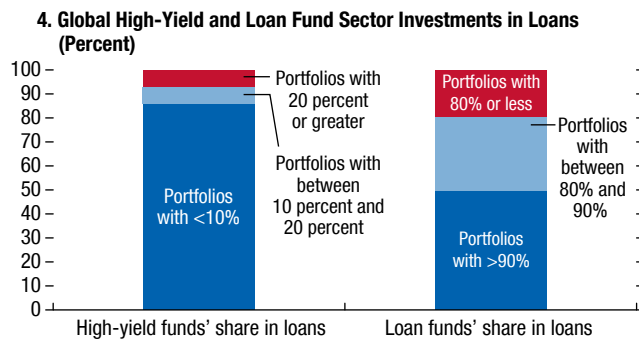
Several large banks account for significant portions of the speculative-grade credit and CLO markets.



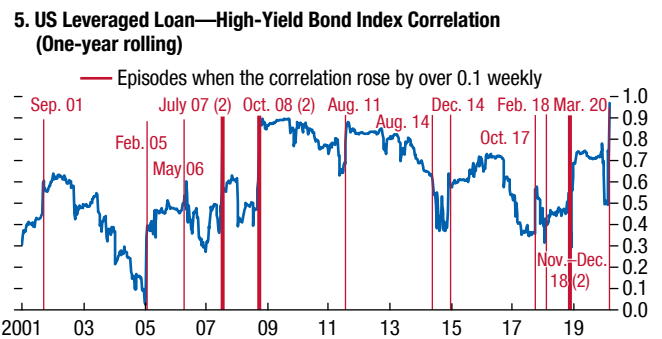
Large fund families hold concentrated positions in the lower-rated segment of the bond market.



Cross-asset holdings by high-yield and loan funds could trigger price spillovers during market stress ...



... punctuated by spikes in correlations between returns of bonds and loans during recent market stress episodes.



Sources: Banks' own Basel Pillar III disclosures; Bloomberg Finance L.P.; Dealogic; Morningstar; and IMF staff calculations.  
 Note: Panel 1 shows the initial exposures by lender's region in the primary market from loan tranche-level data from Dealogic. Loan tranches are sorted by type. Term loan A's and revolving lines of credit are assigned to banks, and term loan B's are assigned to nonbanks. Then, depending on the tranche type, the amount of each tranche is split equally among either banks or nonbanks participating in the syndicate. Finally, for each lender active in the global leveraged loans market, its exposure is calculated as the sum of outstanding amounts across all loan tranches. Panel 2 shows speculative-grade and collateralized loan obligation (CLO) exposures for selected global systemically important banks and other large banks that are active in the leveraged loan and CLO markets. Speculative-grade credit exposures are estimated by using individual institutions' Pillar 3 disclosures, as a summation of exposures at default (EAD) to corporates under both the standardized approach (SA) and internal ratings-based approach. The template CR5 is used to estimate credit risk exposures under SA, based on EAD with riskweights equal to or larger than 75 percent. The template CR6 is used to estimate credit risk exposures under the internal ratings-based approach, based on EAD with probability of default equal to or higher than 0.5 percent. Speculative-grade exposures include high-yield bonds, leveraged loans, some small- and medium-sized enterprise loans, and some emerging market loans. CLO exposures are estimated by using SEC1 as a summation of holdings as originator, sponsor, and investor in the banking book. Panel 3 is based on the issuers of all bonds included in the Bloomberg Barclays US Corporate High-Yield Total Return Index. The x-axis shows the share of individual borrowers/debt that a single fund family holds, indicating that CCC borrowers have greater concentration risk than higher-rated high-yield credits. The y-axis represents the share of the debt of the same individual borrowers that is owned by all investment fund investors. It shows that those borrowers with greater concentration risk by a single fund family are also more exposed to redemption risks than the average US high-yield borrower. This is because their total investment fund ownership often exceeds the 40 percent share that investment funds own of all US high-yield debt. CR = credit risk; SEC1 = securitization exposures in the banking book.

positions in individual credits, especially in those rated CCC (Figure 2.7, panel 3). More than \$130 billion in high-yield debt is subject to concentration risk—defined specifically as debt issued by firms where an investment fund family owns more than 10 percent of debt. In addition, these firms are exposed to concentration risk because investment funds, in aggregate, own a larger-than-average portion of their debt.

The risky segment of credit markets has become more interconnected. On the borrower side, companies issue debt opportunistically both in the high-yield bond and the loan market, and some companies are switching from syndicated loans to private debt based on pricing and opportunities. On the investor side, high-yield and loan funds have material holdings across debt markets (Figure 2.7, panel 4), which could increase price correlations during a stress episode. Indeed, correlation between leveraged loan and high-yield bond returns tends to rise during market downturns, including during the COVID-19 episode (Figure 2.7, panel 5).

### Layers of Leverage Could Interact with Bank-Nonbank Linkages

As discussed above, leverage played an important role in amplifying shocks during the global financial crisis. Leverage in the market can come in three forms: debt issued by firms; leverage embedded in structured finance vehicles, such as CLOs; and financial leverage in the credit system (Aramonte and Avalos 2019). What matters is not simply the levels of various forms of leverage, but also the feedback loops between them—that is, the layering of leverage on top of leverage, which could amplify downward price moves (Figure 2.8). For example, capital call lending is a growing asset class for banks, driven largely by private debt funds looking to enhance returns. This form of financial leverage can worsen losses at private debt funds in a downturn and increase credit and liquidity risks for banks.

Financial leverage is difficult to monitor: availability of data has been an ongoing issue since the global financial crisis and, because it can take novel forms, an assessment of the use of financial leverage is primarily qualitative. At this point, it appears that the use of financial leverage in credit markets (in the form of various credit lines, repurchase agreements, or derivatives) is limited compared with the period preceding the

global financial crisis. However, given the complexity of the ecosystem and the opacity of some of the structures, links in the intermediation chain and interconnectedness of bank and nonbank lenders may entail risks to the banking system, whereby adverse shocks may be transmitted broadly across financial institutions and possibly amplified by the layering of visible and invisible leverage.

### An Economic Downturn Could Trigger Large Losses

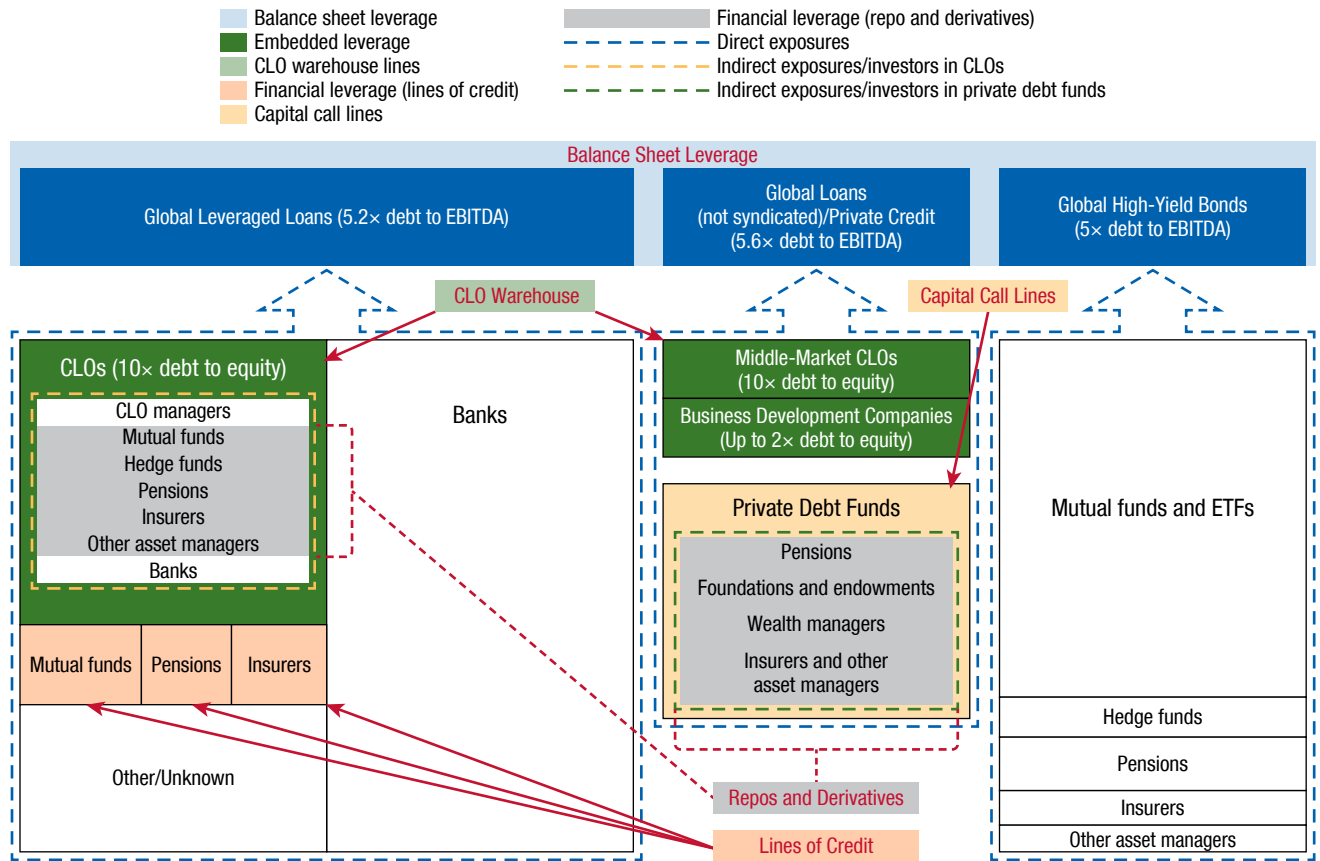
The ecosystem shown in Figures 2.3 and 2.8 is a useful starting point to assess the impact of adverse shocks. An illustrative severe adverse scenario is considered below (Table 2.2, panel 1).<sup>10</sup> The scenario applies the credit rating transition matrix estimated for speculative grade credit after the global financial crisis to the current credit rating compositions of the high-yield bond and leveraged loan markets to obtain downgrades and defaults in these markets. The scenario has the same recovery rate on high-yield bonds as that experienced during the global financial crisis. The recovery rate on leveraged loans is assumed to be 20 percentage points lower than during the global financial crisis to account for reduced credit protections (such as lighter covenants and less debt subordination) and a repricing of earnings addbacks. Market prices experience the same declines as during the global financial crisis. While banks are admittedly more resilient than before the financial crisis and use of financial leverage is more limited, additional amplification mechanisms are assumed to be at play, including sales by investment funds and a reduction in CLO demand for leveraged loans—trends that were already evident during the COVID-19 outbreak.

This scenario analysis considers only the losses resulting from the *direct exposures* of banks, nonbank financial institutions, and CLOs to risky credit markets. Second-round effects, however, could be significant and include, for example, the impact on banks from their lending to nonbank lenders that have suffered losses in these markets. In addition, the losses

<sup>10</sup>The analysis relies on global data for the investor base for leveraged loans, speculative-grade downgrade and default rates, the price shock to high-yield bonds, and individual banks' exposures to speculative-grade credit, and on US data for the investor bases for high-yield bonds, private debt, and CLOs, the price shock to leveraged loans, and the structure of a median CLO.

Figure 2.8. Risky Credit Market Ecosystem

Layers of Leverage in Advanced Economy Risky Credit Markets (Average leverage, end of 2019)



Sources: Bloomberg Finance L.P.; Financial Stability Board; S&P Leveraged Commentary and Data; and IMF staff calculations.  
 Note: CLOs = collateralized loan obligations; EBITDA = earnings before interest, taxes, depreciation, and amortization; ETFs = exchange-traded funds;  
 Repos = repurchase agreements.

Table 2.2. Severe Adverse Scenario—Key Assumptions

The scenario is calibrated based on defaults and market price declines experienced during the global financial crisis.

Credit, mark-to-market, and CLO-related losses are computed based on exposures by lender type.

1. Assumptions about Defaults, Recoveries, and Market Price Declines, by Asset Class (Percent)

	High-Yield Bonds	Institutional Leveraged Loans	Private Debt
<i>Defaults, recoveries on HY, and market price declines are the same as in the GFC. Recoveries on LL are 20 ppts lower.</i>			
Three-year default rate	24	27	27
Recovery rate	25	45	45
Credit loss rate	6	12	12
Market price decline	-34	-40	...

2. Assumptions about Types of Losses, by Asset Class and Lender Type

	High-Yield Bonds	Institutional Leveraged Loans	Bank Leveraged Loans	Private Debt	CLO Equity and Mezzanine Debt
Banks	...	...	Credit	...	...
Insurers	Credit	Credit	...	...	...
Pension Funds	Credit	Credit	...	...	...
Mutual Funds and ETFs	Market	Market	...	...	Model
Hedge Funds	Market	Market	...	...	Model
Others (AM, SMA, BDC)	Market	Credit	...	Credit	Model
Private Debt Funds	...	...	...	Credit	...

Sources: Bloomberg Finance L.P.; Financial Stability Board; Moody's; S&P Leveraged Commentary and Data; S&P Ratings; and IMF staff calculations.  
 Note: Credit losses on CLO highly rated debt for banks, insurers, and pension funds are assumed to be zero. AM = asset managers; BDC = business development companies; CLO = collateralized loan obligations; ETFs = exchange-traded funds; GFC = global financial crisis; HY = high-yield bonds; LL = leveraged loans; ppts = percentage points; SMA = separately managed accounts.

"Credit" refers to held-to-maturity exposures that incur credit losses.

"Market" is for mark-to-market exposures that incur market losses.

"Model" is for exposures to CLO mezzanine debt and equity that are mark-to-market based on a standard overcollateralization test.

from this scenario are *partial*—that is, they encompass only the losses incurred in risky credit markets. However, the deterioration in these markets is assumed to be triggered by a recession—which would bring about wider losses in global equity and investment-grade bond markets. Thus, overall losses at financial institutions are likely to be greater than in the scenario considered, given the large size of other markets.

In this illustrative scenario, credit, mark-to-market, and CLO-related losses are computed based on exposures of various lender types to each of the risky credit markets (Table 2.2, panel 2). Each dollar of exposure is assumed to face only one type of loss. Banks, insurers, pension funds, and private debt funds have mostly held-to-maturity positions and are assumed to incur only credit losses. Mutual funds and ETFs, hedge funds, asset managers, and others are expected to mark their positions to market and are subject to market losses. Market losses can be reversible (as they were after the global financial crisis) after the end of the scenario, but that eventuality is not captured here.

Investors in CLOs experience “mark-to-model” losses based on a standard overcollateralization test in which “excess” CCC and D credits are marked to market based on the weakest credits. CLO mark-to-model losses are not necessarily recorded as mark-to-market losses by investors because CLOs are typically not forced sellers. CLO losses represent lost cash income to equity and mezzanine debt tranche investors, given that the income is diverted to deleverage the CLO or to improve its asset quality composition. This exercise does not incorporate mark-to-market losses on CLO tranches if investors sell them in the secondary market.

Because of a larger proportion of B credit than in the past, a median CLO’s credit quality deteriorates quickly in the scenario considered (Figure 2.9, panel 1). Mark-to-model losses affect 27 percent of the capital stack, reaching mezzanine debt (A and below) in the scenario (Figure 2.9, panel 2), while leaving AAA–AA investors unaffected. For comparison, during the recent COVID-19 outbreak, weaker CLOs—with a high share of CCC credits—have already started to incur mark-to-model losses amid mounting credit rating downgrades.

Overall losses are substantial, totaling more than \$1¼ trillion (or almost 20 percent of total exposures) in the scenario (Figure 2.9, panel 3). Among institution types, investors in CLO equity and mezzanine debt tranches and those with mark-to-market posi-

tions, such as mutual funds and ETFs, have higher nominal losses (Figure 2.9, panel 4). Bank losses appear to be manageable, in aggregate. In addition, banks have the lowest loss rates (defined as a share of exposures) across investors because they hold mostly senior loans with the highest recovery rates and highly rated CLO debt with negligible losses (Figure 2.9, panel 5). By contrast, hedge funds and mutual funds and ETFs with CLO equity tranche holdings and mark-to-market exposures have the highest loss rates.<sup>11</sup>

Many large banks incur losses in excess of 10 percent of their total buffers—that is, the sum of capital and loan loss reserves, in the severe adverse scenario (Figure 2.9, panel 6). Profits would be the first line of defense against shocks, but they are likely to decline during a recession, and Chapter 1 shows that forecast earnings have already been revised down considerably during the COVID-19 outbreak. In addition, given that these estimated losses represent only the direct and partial impact from risky corporate credit markets, bank capital and loan loss reserves may need to be used to cover wider losses from other exposures—equities, investment-grade corporate bonds and loans, lending to households, and credit to nonbank financial institutions, including those that are exposed to risky credit markets.

## Policy Implications

Policymakers should act decisively to contain the economic fallout of the COVID-19 outbreak and support the flow of credit to firms.<sup>12</sup> Once the crisis is over, they should assess the sources of market dislocations and tackle the vulnerabilities in risky credit markets that have been unmasked by this episode.

### Crisis Management Tools Are the First Priority

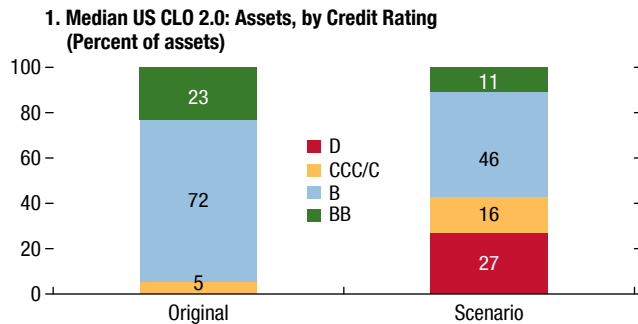
- As discussed in Chapter 1, authorities in major economies are providing considerable support through monetary, fiscal, and financial policies

<sup>11</sup>Although mutual funds/ETFs and hedge funds have similar loss rates, mutual funds/ETFs have substantially larger nominal losses than hedge funds because they have considerably larger exposures to risky credit than hedge funds. One notable source of uncertainty in the estimation of losses for hedge funds is their exposure to leveraged loans due to the lack of direct estimates.

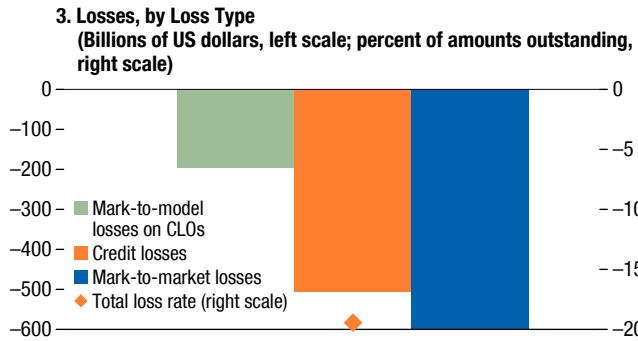
<sup>12</sup>For a list of policy actions taken to date see the IMF’s Policy Tracker: <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19>.

**Figure 2.9. Severe Adverse Scenario: Impact on Collateralized Loan Obligations and Overall Losses**

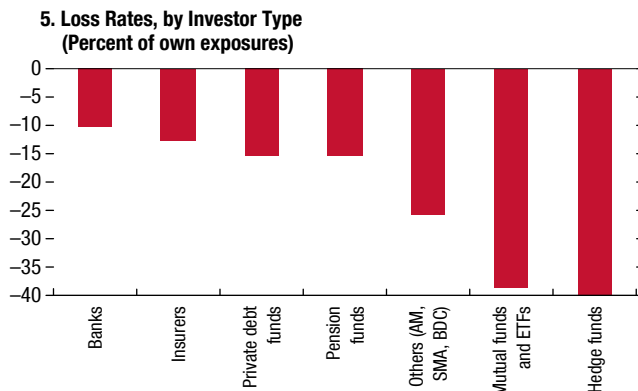
CLOs have a high share of lower-rated credits, which deteriorate quickly in the severe adverse scenario ...



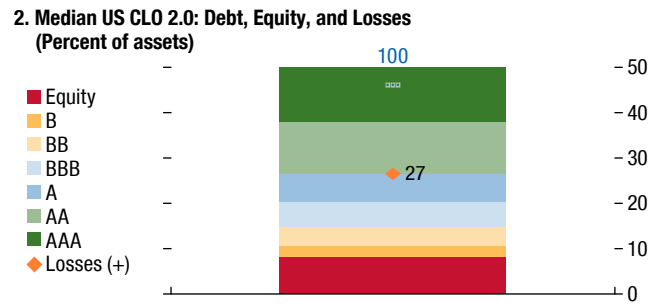
Overall losses are substantial in the scenario.



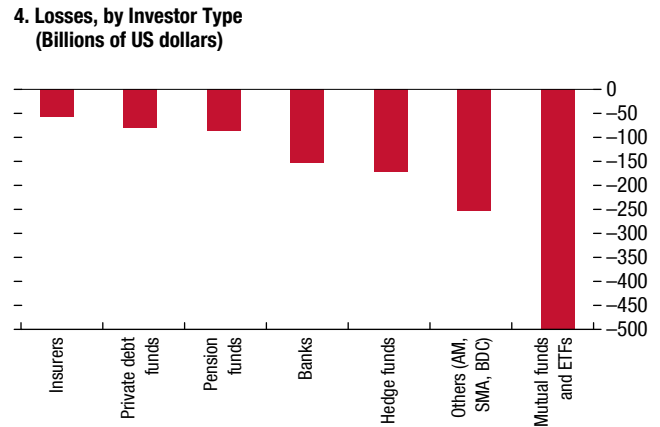
Banks have the lowest loss rates, which are still above the worst charge-offs on mortgages during the global financial crisis.



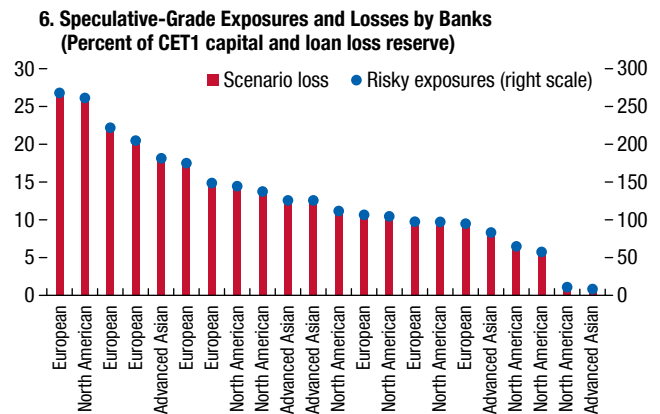
... which leads to substantial mark-to-model losses on the equity and mezzanine debt tranches.



Investors with mark-to-market exposures have higher nominal losses, while investors in CLO equity and mezzanine debt tranches incur lost cash income.



Many large banks incur losses in excess of 10 percent of their total buffers in the scenario.



Sources: Banks' own Basel Pillar III disclosures; Bloomberg Finance L.P.; Financial Stability Board; Moody's; Morningstar; Preqin; S&P Leveraged Commentary and Data; and IMF staff calculations.

Note: In panel 2, the y-axis is cut off at 50 percent, though AAA debt amounts to 68 percent of assets. In panel 6, the sample of banks includes selected global systemically important banks and other large banks that are active in the leveraged loan and CLO markets. Speculative-grade credit exposures are estimated by using individual institutions' Pillar 3 disclosures, as a summation of exposures at default (EAD) to corporates under both the standardized approach (SA) and internal ratings-based approach. The template CR5 is used to estimate credit risk exposures under SA, based on EAD with risk weights equal to or larger than 75 percent. The template CR6 is used to estimate credit risk exposures under the internal ratings-based approach, based on EAD with probability of default equal to or higher than 0.5 percent. Speculative-grade exposures include high-yield bonds, leveraged loans, some small- and medium-sized enterprise loans, and some emerging market loans. Individual large banks' regions are shown instead of bank names. CET1 capital refers to Common Equity Tier 1 capital. Advanced Asia refers to Japan. Europe refers to the European Union and the United Kingdom. North America refers to Canada and the United States. AM = asset managers; BDC = business development companies; CLO = collateralized loan obligations; ETFs = exchange-traded funds; GFC = global financial crisis; SMA = separately managed accounts.

to cushion the impact of the crisis on the *broad corporate sector*. Major advanced economy central banks have initiated or increased purchases of investment-grade corporate debt.<sup>13</sup> Furthermore, in early April, the US Federal Reserve extended support to some investment-grade bonds downgraded to speculative grade after March 22, some ETFs invested in high-yield bonds, newly issued highly rated CLO tranches, and some small- and medium-sized enterprises whose leverage remains below specific thresholds.<sup>14</sup> In late April, the European Central Bank also expanded its eligible collateral for loans to banks to include investment-grade bonds downgraded to speculative grade after April 7. These measures appear to have improved market functioning and eased near-term stress in these markets, as evidenced by the narrowing in corporate credit spreads and the gradual reopening of the primary market for high-yield bonds and leveraged loans.

- Should financial conditions deteriorate further, and credit downgrades and defaults rise meaningfully, authorities may consider *further extending their support to risky credit markets*. Measures directed at maintaining the flow of credit in these segments would help prevent severe and prolonged disruptions that would affect firms and the broader economy. Because *no direct support has been provided to the*

<sup>13</sup>The US Federal Reserve established two facilities for investment-grade corporate debt—the Primary Market Corporate Credit Facility for new bond and syndicated loan issuance and the Secondary Market Corporate Credit Facility to provide liquidity for outstanding corporate bonds and ETFs. The European Central Bank expanded its Corporate Sector Purchase Program to include nonfinancial commercial paper, the Bank of England increased the size of its Corporate Bond Purchase Scheme, and the Bank of Japan increased the auction amounts of outright purchases of commercial paper and corporate bonds.

<sup>14</sup>As part of the Federal Reserve's Primary and Secondary Market Corporate Credit Facilities, the definition of eligible issuers for purchase was expanded to include those that were rated at least BBB-/Baa3 as of March 22, 2020, but are subsequently downgraded and rated at least BB-/Ba3 at the time the facility makes a purchase. The eligibility criteria for ETF purchases includes a preponderance of ETF holdings of those funds whose primary objective is exposure to US investment-grade corporate bonds, and the remainder will be in ETFs whose primary objective is exposure to US high-yield corporate bonds. The Federal Reserve's Term-Asset Loan Facility expanded the eligible collateral to include AAA tranches of static CLO deals issued after March 23, 2020. The Main Street New Loan Facility limits eligibility to borrowers that do not have debt higher than four times 2019 adjusted earnings before interest, taxes, depreciation, and amortization (EBITDA), while the Main Street Expanded Loan Facility has a debt limit of six times 2019 adjusted EBITDA.

*bulk of risky credit markets thus far* (bonds that are deeply downgraded from investment grade, CLOs that were issued before late March and those that are actively managed, and small- and medium-sized enterprises with high leverage are not currently eligible for these facilities), credit markets have shown signs of divergence, with a still considerable gap between investment- and speculative-grade spreads.

- During the crisis, firms have relied on bank credit lines as an important source of liquidity. Supervisors should continue to monitor the banking sector to *ensure banks are in a good position to provide funding to speculative-grade firms*, while banks' existing capital and liquidity buffers should be used to absorb financial costs of any customer loan restructuring and to relieve pressures on banks' funding and liquidity using full flexibility within the existing regulatory frameworks.

### The Crisis has Uncovered Many of the Vulnerabilities Discussed in this Chapter

- While market price declines in the high-yield-bond and leveraged-loan markets reached two-thirds of the descent during the global financial crisis in March, the speed of deterioration has been unprecedented, driven by sharp increases in credit and liquidity risks.
- Preexisting concerns about elevated borrower leverage, earnings addbacks, sectoral structural weaknesses, weak covenants, reduced investor protections, and large shares of weak credit have likely magnified investors' perception of *credit risk*, as reflected in sharply wider credit spreads and significantly higher forecasts of rating downgrades and defaults.
- Selling pressure triggered by broad-based demand for cash has raised *liquidity risk*, as evidenced by the sharp declines in the new issuance of risky credit during the COVID-19 outbreak, alongside record-high bid-ask spreads on corporate bonds and deep ETF price discounts in March. Interconnectedness across risky credit markets and the global nature of their investor base have likely contributed to market dislocations. Mutual funds, which were seen as one of the main pressure points in terms of liquidity risks, have experienced large outflows, even though outflows have moderated more recently. Capital committed but not yet invested (dry powder) does not appear to have been deployed yet, likely reflect-



ing uncertainties about the impact of the virus on the economy.

### After the Crisis, Medium-Term Vulnerabilities Should Be Tackled

- Once the COVID-19 crisis is contained, authorities should conduct a comprehensive analysis to identify the sources of market dislocations and assess vulnerabilities that have been unmasked.
- Given the large role of nonbank financial institutions in risky credit markets, and based on the behavior of these institutions during the recent episode, authorities may consider whether *a widening of the regulatory and supervisory perimeter to include nonbank financial institutions active in risky credit markets* may be warranted. A framework for macroprudential regulation of nonbank financial institutions should be developed, taking into consideration the global nature of these markets. Such a framework is largely absent. The macroprudential toolkit should be expanded to account for the growing importance of nonbank financial institutions (see the October 2019 GFSR).
- *Policymakers should promote greater transparency in credit markets.* To enable proper assessment of risks in these markets, authorities should ensure that they have sufficient data to analyze risks stemming from current origination practices and chains of intermediation in the corporate debt market. Cross-border and global exposures to risky credit markets should be better measured.
- Bank supervisors in key economic areas should collaborate on data sharing to take account of macro-financial interconnections domestically and internationally. Given the commonality of corporate exposures at large banks and links across banks and nonbank financial institutions, as well as cross-border features of global credit markets, greater international collaboration on data sharing may be desirable to gauge risks in the banking system.

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