

# Property

## Which European CRE loans defaulted and why?

Mark Nichol

mark.nichol@bofa.com  
Int'l CMBS/ABS Strategist  
MLI (UK)  
+44 20 7996 0965

Alexander Batchvarov, CFA

alexander.batchvarov@bofa.com  
Int'l Str. Fin. Strategist  
MLI (UK)  
+44 20 7995 8649

25 March 2024 | Structured Finance | Global | Property

### Key takeaways

- We update our analysis of the drivers of European CRE loan defaults and include more analysis of 2.0 loans.
- Defaults increased sharply at leverage 'tipping points': 60% initial and exit LTV, 11% debt yield and 2.5x ICR.
- Lessons learned from the GFC have benefitted the performance of newer loans but new sources of risk have emerged.

LTV: Loan-to-value ratio

ICR: Interest cover ratio

This is an update of the analysis we published in 2023 (<https://rsch.baml.com/r?q=SGkA9nCqPieAZFNCKsH8kw>) on the drivers of CRE loan defaults and losses historically in Europe and the UK based on an analysis of over 1,200 loans totalling €197bn dating from 2000 using data provided by Trepp. We think these findings could be incorporated into underwriting and credit analysis by investors, lenders and regulators.

To date, aggregate losses represent 3.9% of the original aggregate loan amount. The aggregate default rate is now 16.9% by loan amount and 22.3% by number of loans, which reflects the concentration (ca. 70%) of loans advanced from 2005 to 2007. The average loss severity has been 22.8%.

Among loans originated post-GFC, the default rate has been 9.3% (15 loans), resulting in one loss so far, although we expect more to come. Some of these defaults have been cured but in other cases we think losses are likely.

#### Historical drivers

- Vintage** - Almost all losses occurred in loans issued from 2005 to 2007. The property cycle was a major driver of loan performance, in our view.
- Leverage** - LTV, exit LTV, debt yield and ICR are good predictors of default, including among the most at-risk loans made in 2005 to 2007. We observed pronounced 'tipping points' at which levels default rates increased sharply: at 60% LTV, 11% debt yield and 2.5x ICR. Lenders, however, may find it difficult to adhere to these limits in competitive market conditions.
- Property type** - The stability of property income contributed to loan performance, in our view. The default rate was lowest among residential properties and high among hotels and retail property, which we think reflects high leverage and single tenants in many hotel loans and structural challenges facing the retail sector.
- Country** - We found less evidence that the jurisdiction of the properties had a material influence on defaults or losses.

#### Idiosyncratic factors

In general, loss severity rates have little relation to the initial credit metrics of loans. We suspect idiosyncratic issues, which are difficult to anticipate when underwriting a loan, may be largely responsible for losses. The largest losses occur where debt service relies heavily on one tenant that subsequently becomes insolvent or vacates.

#### Mitigants

Despite the difficulty of predicting loss severity, we suggest ways, in addition to reducing leverage, to potentially limit the scale of losses: (i) Focus on higher credit quality tenants or more granular tenant pools, (ii) include more scheduled amortisation during the loan term, and (iii) ensure the tenor of interest rate swaps matches that of the loan or use caps instead.

## What has changed?

In this iteration of our analysis, the data set has increased by 3 loans securitised in 2023, totalling €0.9bn. In the past year, four new defaults have occurred and losses were realised in the case of three previously defaulted loans while two defaults were resolved without a loss. Waivers from servicers averted defaults in other cases.

Loan workouts over the past year crystallised €235mn of principal loss bringing aggregate losses to €7.6bn (from €7.4bn in 2023), which corresponds to 3.9% of the aggregate initial loan amount.

We have continued our analysis of CMBS 2.0 loans, being those originated after the global financial crisis (GFC). Of the 162 loans totalling €46bn securitised since 2011, 15 have defaulted to date. One default has resulted in a loss, five were subsequently repaid in full at no loss, four were cured and five remain unresolved.

## Data composition

Our data set of pre-GFC loans has not changed. We used data from Trepp to analyse the historical performance of over 1,200 commercial property loans totalling €197bn that were written in Europe and the UK from 2000 to 2023. We consider Trepp to have the most comprehensive data coverage of the CMBS sector in Europe and the UK. We use the term 'Europe' generically to include all available data including the UK. The 20 countries included in the analysis are listed below in the section, 'Jurisdiction'.

There were no loans originated in 2009 or 2010 in the data set. We include 162 loans (amounting to €46bn) that were originated and securitised after the GFC from 2011 to 2023. We follow market convention in referring to these as CMBS 2.0 transactions.

We analysed securitised loans owing to their greater transparency and availability of data. CMBS debt is often publicly listed and periodic performance reports are freely available as a matter of public disclosure. By contrast, banks and other balance sheet lenders typically do not disclose the performance of the loans they hold on balance sheet.

We think the loans used in our analysis are broadly representative of the broader universe of CRE loans including those that were not securitised. In another report we showed that prior to the GFC, securitised loans probably out-performed non-securitised loans (<https://rsch.baml.com/r?q=t1UA2q2lyGZdgvFNi58M5g>) in some jurisdictions. Data released by the Bank of England show that UK banks had written off 10% of their CRE loan holdings by 2018, compared with 4% for securitised loans over the same period. On the other hand, we accept that some balance sheet lenders have traditionally had a lower risk tolerance (and lower return expectations) and will have outperformed the securitised loans analysed in this report.

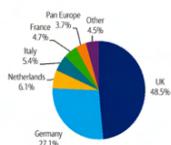
The UK was the largest market in the study with 518 loans totalling €96bn, followed by Germany (€53bn, 330 loans), the Netherlands (€12bn, 47 loans), Italy (€11bn, 88 loans) and France (€9bn, 98 loans). These five jurisdictions represent 91% of the total. In addition, loans backed by properties located in more than one European country represented €7bn (26 loans). The remaining €9bn comprised 103 loans with properties located in one of 15 other European countries.

By type of use, office properties represented the largest sector at €50bn followed by mixed property at €44bn (this comprises property portfolios containing a mix of property types and mixed-use properties, which usually contain a component of office space plus one or more other uses in the same property), retail property at €36bn, residential property (including multi-family and student housing) at €29bn, industrial property (including logistics, warehousing and distribution) at €13bn, healthcare

property (including hospitals and care homes) at €5bn and hotels & leisure property at €5bn. Other property types are

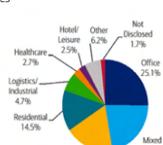
represented to a lesser degree including petrol stations (€0.5bn), self-storage (€0.4bn) and car parking (€0.3bn), amongst others.

**Exhibit 1: Distribution by country of €197bn loans**  
The UK and Germany are the largest markets



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

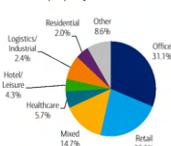
**Exhibit 2: Distribution by property type of €197bn loans - All Europe**  
Office and mixed use are the dominant property types



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

Within the UK, loans were distributed similarly to the European average, with most being secured by office, retail and mixed property. In Germany, offices were less prevalent at just 11% while multi-family residential rental properties were most prevalent at 41%. Multi-family residential is a large investment sector in Germany and is not present to the same extent in the UK.

**Exhibit 3: Distribution by property type of €96bn loans - UK only**  
Office and retail property dominate UK lending



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 4: Distribution by property type of €53bn loans - DEU only**  
Residential and mixed property dominate German loans



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

The data set does not include the seven Business Mortgage Finance transactions, which provided €4.9bn of debt to SME borrowers in the UK from 2004 to 2007. These transactions were highly granular with each containing hundreds of loans. We also excluded a number of transactions that we deemed to be (i) re-securitisation transactions, or (ii) fully retained by issuers for central bank repo purposes, which we felt did not represent credit risk being sold into the market.

For pre-GFC loans we are not able to identify defaults that were resolved without a loss. Examples include covenant breaches that pushed loans into special servicing but did not involve a payment shortfall, and balloon defaults followed by full repayment after the property was sold. As such, our calculated default rates underestimate, and our loss severity figures overstate, to some degree, the true experience for the sector.

## Historical performance: default and loss rates

In this report, we use the term 'loss severity' and 'loss given default' (LGD) interchangeably to refer to the amount of principal loss that was realised relative to the initial nominal amount of the loan.

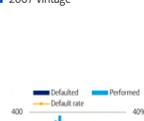
To date, losses have totalled €7.6bn, which represents 3.9% of the €197bn total issuance. To date, 271 loans with original balances totalling €33.5bn have defaulted, an aggregate default rate of 17.0% by amount and 22.4% by number of loans. Smaller loans were more likely to default than larger loans.

In the UK, 106 loans with original balances totalling €13.0bn have defaulted, which represents an aggregate default rate of 13.6% by amount and 20.5% by number of loans.

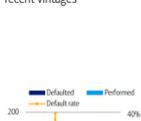
In Germany, 113 loans with original balances totalling €10.3bn have defaulted, which represents an aggregate default rate of 19.3% by amount and 34.2% by number of loans. These default rates are higher than those of the UK, which we think may suggest the loans that were securitised in Germany were ineligible for banks' covered bond programmes. Covered bonds provide funding to German banks, typically at a lower cost than CMBS but impose limitations on leverage, seniority and other characteristics, which CMBS does not.

There have been 15 defaults among loans advanced after the GFC. Their causes differ from those of pre- GFC defaults, which we discuss later in the report.

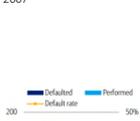
**Exhibit 5: Default rate by no. of loans - All Europe**  
Defaults were highest in the 2007 vintage

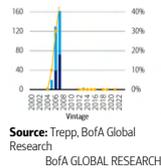
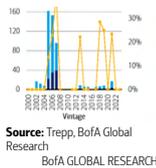
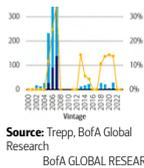


**Exhibit 6: Default rate by no. of loans - UK only**  
Pre and Covid drove defaults in recent vintages



**Exhibit 7: Default rate by no. of loans - Germany**  
No defaults in Germany since 2007

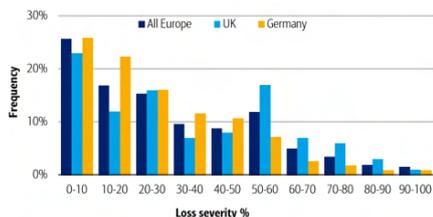




Among all European loans, LGD or loss severity ranged from 0% to 98.2% of the original loan amount. The average and median loss severity were 29.6% and 24.7% respectively, again with the caveat that we are not able to include defaults that were resolved without a loss for loans made prior to the GFC. The distribution of losses is skewed towards lower loss severities. In a quarter of cases the loss severity did not exceed 10% and in a quarter of cases the loss severity exceeded 45%.

Loss severities were higher in the UK than in Germany on average, as shown below.

**Exhibit 8: Distribution of principal losses**  
Losses tended to be smaller in Germany than in the UK



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

There could be more defaults and losses crystallised in the future from pre- GFC loans that remain outstanding in special servicing.

## Jurisdiction

The data included loans from 20 European countries. In order of aggregate loan amount they are: the UK, Germany, the Netherlands, Italy, France, Spain, Finland, Switzerland, Ireland, Austria, Sweden, Belgium, Greece, Romania, Portugal, Poland, Bulgaria, Luxembourg, the Czech Republic and Monaco. In addition, a number of loans contained properties located in multiple jurisdictions, which we refer to as pan-European.

In the preceding list, the aggregate amounts from the countries appearing after Switzerland were relatively small, such as €16mn in Monaco and €785mn in Ireland, which limits our ability to draw meaningful conclusions about performance in smaller jurisdictions.

Loan defaults and losses have occurred in 14 countries: the UK, Germany, France, the Netherlands, Spain, Italy, Finland, Ireland, Belgium, Greece, Luxembourg, Austria, Poland and Switzerland, as well as in pan-European portfolios.

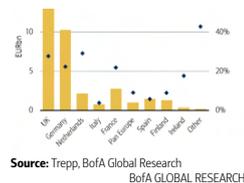
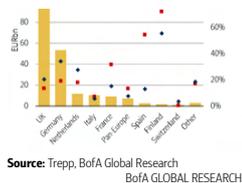
The aggregate default rates have been middling in the largest markets, **the UK and Germany**, at 13.6% and 19.3% respectively, which we think reflects the more granular data sets in the largest markets. The average loss severity has been 27.7% among UK defaults and 22.3% among German defaults, in our analysis. We think swap break costs may have contributed to the UK's higher losses, particularly where long-dated interest rate swaps were used in some cases when the £ yield curve was inverted from 2005 to 2008.

By comparison, in **France** and the **Netherlands** the aggregate default rates have been 31.8% and 18.2% respectively while average loss severities have been 21.9% and 29.1% respectively.

Among the larger jurisdictions, **Switzerland** stands out with the lowest default rate at just 0.6% by loan amount. There was one default out of 28 Swiss loans in our data set. The CHF13.5mn Klimson loan was advanced in October 2016 and failed to repay at its maturity date in July 2013. It was secured predominantly by a retail shop located in Basel, Switzerland. The anchor tenant, Klimson AG, had vacated in advance of its lease maturity in October 2013, which we think created significant refinancing challenges for the borrower. The identity of the borrower sponsor was not disclosed to our knowledge. Initially the loan had a LTV ratio of 83.0% an ICR of 181% and a debt yield of 6.8%. The underlying property was sold at a principal loss of CHF7.8mn, corresponding to a loss severity of 57.5% of the original loan amount.

**Exhibit 9: Default rate by country**  
Wide variation between jurisdictions

**Exhibit 10: Loss severity rate by country**  
Losses averaged around 20-30% in main markets



In smaller jurisdictions, the frequency and severity of losses varies greatly owing to the smaller number of loans in each country, which makes the averages highly volatile. It is difficult to determine whether the results are reflective of the market as a whole or have been skewed by an outlier. As such we question the usefulness of the results for the less represented countries.

For instance, the default rate of Spanish loans is disproportionately high at 55%, although this is not representative of the country in our view. Rather it is driven by one large default, the €1.3bn Silverback loan, which defaulted when the borrower lost SOCIMI status but was subsequently fully repaid in our understanding. This loan represents almost half of total aggregate loan amount from Spain of the 23 Spanish loans in our data.

Similarly, in Finland the three largest loans defaulted out of nine in our data set. In addition, two smaller loans defaulted producing an aggregate default rate of 72%. We question how indicative this is of the Finnish market or whether lower quality assets are more likely to be securitised. Most recently, the Frosn loan defaulted at maturity (<https://rsch.baml.com/r?q=9qzjQLTmXNVkh1stdr!AGQ>) after noteholders rejected a proposal to extend the debt in exchange for higher coupons among other modifications. The outlook for Frosn is unclear and losses are not certain, in our view.

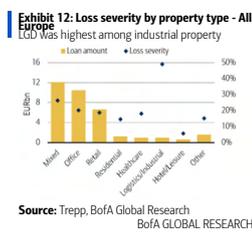
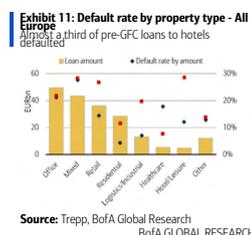
**Property type**

Loans secured by office, retail and mixed (being mixed-use properties and portfolios containing a mix of property types) property represent 66% of the loan collateral in our analysis. They had similar default rates in the range of 22%-28% by number of loans. By loan amount, retail defaults were lower at 14%, which we think reflects the better performance of larger prime shopping centres compared to smaller retail properties.

In certain types of property, rental income tends to be more stable or more volatile, which has a bearing on default rates. Historically, income has been relatively stable in large shopping centres and rented residential property, which may have hundreds of tenants supporting debt service, and less stable in operational properties such as hotels. More recently, prime shopping centres have been less stable than in the past owing to lockdown closures and structural changes arising from online shopping.

Loans backed by residential property were least likely to default, in our analysis. We use the term, residential, to encompass multifamily property (89 loans), student housing (13 loans) and social housing (2 loans). Just 4.3% of these loans defaulted. The average loss severity of 14.5% was also lowest among the property types.

Defaults were most prevalent among loans backed by retail property and hotel/leisure property, which encompasses hotel, theatre, cinema, casino and fitness centre properties as well as Centre Parcs locations in the UK. Almost a third (30%) of pre-GFC hotel/leisure loans defaulted, while among post-GFC loans the aggregate default rate is 25%. Where defaults occurred loans tended to be small in size. The average loss severity was 20.7% among defaults that have been resolved, which is comparable to other property types.



During the GFC, loans backed by logistics/industrial property were among the most likely to default with an average default rate of 30%. These loans produced the highest average loss severity at 49.0%. These loans did not benefit from the boom in logistics demand that materialised from the growth in online shopping after the GFC. None of the 14 logistics loans advanced post-GFC defaulted. The better performance of post-GFC loans has reduced the logistics/industrial default rate to 7% by aggregate amount.

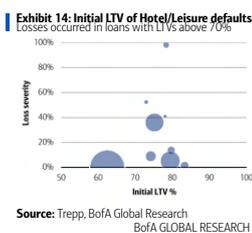
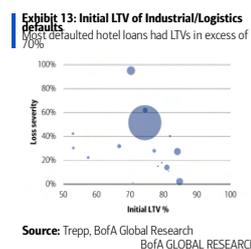
The frequency of defaults in pre-GFC logistics/industrial CRE loans was largely due to the high leverage of the loans, in our

view. The average initial LTV ratio of the logistics/industrial loans that defaulted was 73.0%. The initial LTV exceeded 70% in the case of 12 of the 16 logistics/industrial loan defaults we observed, as shown in the chart below. The higher leverage involved probably explains much but not all of the logistics/industrial default rate, we think. The relatively small number of unrated tenants backing some logistics/industrial loans likely also contributed.

Among 27 logistics/industrial loans advanced post-GFC, the average LTV has been 62.5% and none has defaulted. The logistics/industrial loan performance in our analysis seems to warn against exposures to single (unrated) tenants and using leverage in excess of 70% LTV.

A closer look at the defaulted hotel/leisure loans reveals a similar underlying theme. All of the losses occurred in loans with initial LTVs above 70%, as shown in the chart below. None of the hotel/leisure loans that had an initial LTV below 70% suffered a loss.

The highest loss severity we observed, 98%, occurred in a hotel loan: a £4.0mn loan secured by a £5.1mn hotel located in Derby, UK. The property was sold by receivers for £1.55mn. After deducting selling costs and swap break costs the loan recovered just £72,000 or 2% of the original loan amount.



More recently, the 2019 vintage hotel transaction, ELoC 37 defaulted following Covid lockdowns when it breached its debt yield covenant in October 2020. The sponsor, London & Regional, injected capital to partially prepay the loan in exchange for waivers. Subsequently the breaches were cured and the loan is currently performing.

Two more hotel transactions, Ribbon 2018 and Magenta 2020, were similarly granted waivers of financial covenants during the pandemic in exchange for equity injections, which allowed them to avoid defaults. Ribbon 2018 was fully redeemed earlier this year. Magenta 2020 was restructured with the consent of noteholders in December 2021 and is currently performing. Another hotel loan, Sellar, breached DSCR and LTV covenants in 2023 but was restructured by the special servicer, which cured the default.

The pandemic created unique stress for hotels, such as government imposed lockdowns and reduced travel volumes, that severely affected revenues. The Covid stresses were unrelated to normal economic or property cycles and the subsequent underperformance does not reflect upon the underwriting quality of the loans, in our view.

**Vintage**

All but one of the 257 loans that suffered a loss were in transactions issued from 2005 to 2007. This is not surprising since commercial property values began to decline in 2007 in many European countries for the first time since prior to 2000.

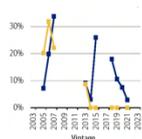
The one loan from a post-GFC vintage that suffered a loss was the Debussy Toys 'R' Us transaction, which defaulted in 2018 following the insolvency of the sole tenant, Toys 'R' Us. The properties were sold and the loan realised a 25% loss. However, Debussy was a distressed restructuring of a defaulted pre-GFC transaction and does not represent a new financing of performing assets, in our view. As such, we view it more as a CMBS 1.0 transaction than a 2.0 transaction.

Otherwise, none of the other 13 defaults among 2.0 transactions has resulted in a loss, although we see a handful of candidates among the eight loans that remain outstanding.

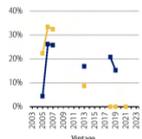
In the UK, loan defaults were relatively low among the 2005 vintage at 4.5% by loan amount, before increasing sharply to 26.2% and 25.8% for the 2006 and 2007 vintages respectively. Loss severities followed a similar pattern, reaching 33% in 2006 and 2007, as illustrated below. The insolvency of Intu tipped several 2013-vintage loans into default, although no losses have been realised to date.

In Germany, defaults were low in the 2005 vintage at 7.0%, increased to 14.8% in 2006 and reached 37.3% in the 2007 vintage. Loss severities peaked at 27.6% among 2006 loan defaults and decreased to 19.9% in the 2007 vintage.

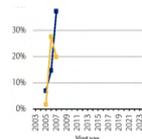




Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

The high default rate registered among 2015 vintage loans was driven by a technical default of the €1.4bn loan backing Silverback Finance, a sale and leaseback of Santander bank branches in Spain. In 2020 Santander brought the borrower back on balance sheet, which caused the loss of its SOCIMI status and triggered a default under the transaction docs in our understanding. In response, Santander undertook to repay the loan but the repayment was held up, despite the funds being available, pending disagreement over whether prepayment fees were owing, which was subsequently brought to the English courts and remains unsettled, in our understanding. According to Bloomberg, the notes have been redeemed and we attribute nil loss to Silverback Finance.

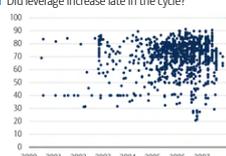
**Was leverage higher in 2007?**

The LTV ratios of new loans did not appear to be increasing significantly leading up to 2007, as illustrated in the following chart. Throughout the data period from 2000 to 2007 there was always a portion of borrowers who borrowed at relatively conservative LTVs of around 40%.

Similarly, the temptation to use high leverage in real estate investing is also observed with LTVs in excess of 80% being employed going back to the earliest data from 2000. The attractiveness to property investors of financial leverage is not limited to securitised debt, in our view.

In the run up to 2007 the bulk of new loans were originated with LTVs between 60% and 85% with an average of around 70%, although there were also a number of loans originated with LTVs as low as 20% and as high as 90%. According to the DeMontfort University lending report (now published as the Bayes lending report), the average LTV of new CRE loans in the UK was in the range of 75% to 80% for both prime and secondary quality property from 1999 to 2006.

**Exhibit 18: Initial LTV of CRE loans, %**  
Did leverage increase late in the cycle?



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 19: UK commercial property values**  
Capital values fell 45% during the GFC



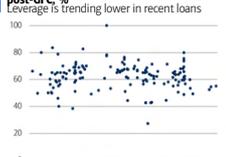
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Despite the apparently stable LTV ratios leading up to 2007, leverage was increasing in the form of increasing debt quanta.**

As property values increased, so did the amount of debt borrowed at a given LTV. The subsequent dramatic decline in property values after 2007 left some loans exposed to losses. Sizing debt quanta using a sustainable LTV concept during the 2005-2007 period could have helped to lessen the build-up of debt and reduce the scale of losses subsequently, in our view.

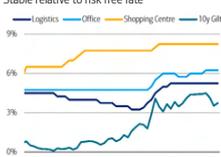
More recently, the leverage of new loans has been trending lower while office property values have been fairly static over the past five years, as illustrated below. Compared to the environment in 2007 we think outstanding loans look better positioned to weather the current downturn.

**Exhibit 20: Initial LTV of CRE loans originated post-GFC, %**  
Leverage is trending lower in recent loans



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 21: UK commercial property yields**  
Stable relative to risk free rate



Source: CBRE, BofA Global Research  
BofA GLOBAL RESEARCH

**Timing of defaults**

## TIMING OF DEFAULTS

Defaults were most likely to occur at the loan maturity date as opposed to during the loan term. Just 15% of losses were realised before maturity, which we think suggests that balloon defaults represent the majority of defaults. This is consistent with the decline in property values and lack of refinancing available during the GFC.

Since the GFC this trend has reversed. Among loans advanced after the GFC, 11 of the 15 defaults occurred during the loan term compared to four balloon defaults at maturity. This reflects covenant breaches that occurred as a result of Covid lockdowns and the recent sharp rise in interest rates. Going forward, we think more balloon defaults are likely to occur as refinancing conditions remain challenging.

## LTV

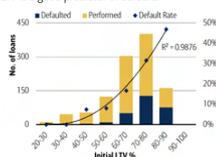
We found the initial LTV to be a good predictor of defaults but a weak predictor of Loss Given Default. Unsurprisingly, the likelihood of a loan defaulting increases as its LTV increases. In this section we focus on just those loans that were made in vintages that experienced at least one default; immaculate vintages are excluded from the analysis.

Just four loans with an initial LTV of less than 50% have incurred a loss, corresponding to a default probability of 3.6% by number of loans. Of the 236 loans we observed with an initial LTV of 60% or less, 14 defaulted, corresponding to a probability of 5.9%. Above the 60% LTV level, the default rate rises sharply: 254 of 872 loans (29.1%) defaulted. This LTV tipping point could support using a 60% advance rate as the limit for the leverage of senior loans, above which junior or mezzanine debt would begin to attach, in our view.

Among the loans that had an initial LTV between 60% and 70%, 16.7% defaulted. This increased to 31.6% and 46.9% for loans with initial LTVs between 70-80% and 80-90%, respectively. There were three conduit loans written with an initial LTV above 90% and they were repaid in full.

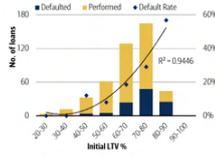
In the UK, the same pattern was observed with a LTV tipping point at 60%. The default rate of loans with initial LTVs between 50%-60% was 7.3% rising to 19.0% between 60%-70%, 28.2% between 70%-80% and 56.8% between 80%-90%, as illustrated below.

**Exhibit 22: Default rate by initial LTV - All Europe**  
LTV is a good predictor of defaults



Source: Trepp, BofA Global Research  
BoFA GLOBAL RESEARCH

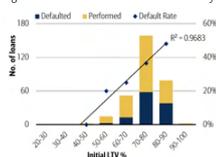
**Exhibit 23: Default rate by initial LTV - UK only**  
57% default rate amongst highest LTV loans



Source: Trepp, BofA Global Research  
BoFA GLOBAL RESEARCH

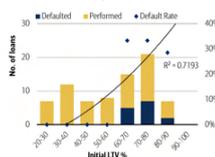
In Germany, we again see possible evidence that pfandbriefe dominates low-LTV lending based on the almost complete absence of loans with LTVs below 60%, illustrated in the chart below. The loans in our sample performed broadly consistently with their UK counterparts at LTVs ranging from 60-90%.

**Exhibit 24: Default rate by initial LTV - Germany only**  
Higher LTV loans were securitised in Germany



Source: Trepp, BofA Global Research  
BoFA GLOBAL RESEARCH

**Exhibit 25: Default rate by initial LTV - France only**  
No defaults below 60% LTV



Source: Trepp, BofA Global Research  
BoFA GLOBAL RESEARCH

In other countries we find the same relationship between LTV and default rate, albeit with diminishing significance ( $R^2$ ) as sample sizes decrease. We illustrate the performance in France, Italy and the Netherlands.

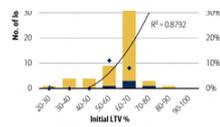
In the future, we think it would be useful to include mezzanine debt in this default analysis. That is, we think the presence of mezzanine debt, which is not securitised, increases the probability of default for the securitised loan, although we were not able to analyse this relationship.

**Exhibit 26: Default rate by initial LTV - Italy only**  
Limited reliability based on just 5 defaults in the data

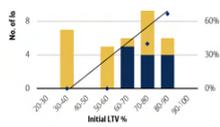


**Exhibit 27: Default rate by initial LTV - Netherlands only**  
No defaults up to 60% and 13 defaults above 60%





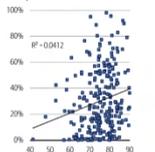
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

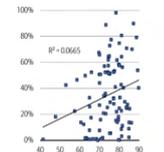
Loss severity generally increased as the initial LTV increased, although with a wide distribution, evidenced by low  $R^2$  values, which suggests that other factors contribute to loss severity. In this section we exclude defaults that were cured without loss.

**Exhibit 28: Loss severity by initial LTV - All Europe**  
LTV is a poor predictor of LGD in Europe



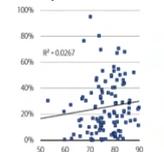
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 29: Loss severity by initial LTV - UK**  
LTV is a poor predictor of LGD in the UK



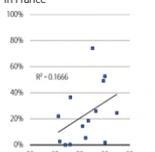
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 30: Loss severity by initial LTV - Germany**  
LTV is a poor predictor of LGD in Germany



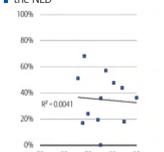
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 31: Loss severity by initial LTV - France**  
LTV is a weak predictor of LGD in France



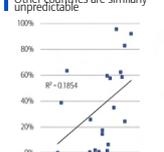
Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 32: Loss severity by initial LTV - Netherlands**  
LTV is a poor predictor of LGD in the NLD



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 33: LGD by initial LTV - Rest of Europe**  
Other countries are similarly unpredictable



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

## Exit LTV

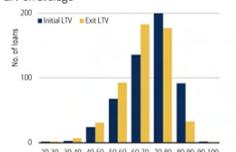
Some loans are scheduled to amortise partially during the loan term, although typically to a limited degree. It is worth considering to what extent scheduled amortisation may reduce default risk. Here we refer to the LTV at maturity as the 'exit LTV'.

We have exit LTV data for over 500 loans, of which around 40% were bullets and 60% had some scheduled amortisation. Where amortisation was present, the LTV was reduced by 6.5 percentage points on average over the life of the loan, from the initial LTV to the exit LTV.

Default rates were similar among bullet and amortising loans at 32% on average. This appears to suggest that while LTV helps to predict default risk, the amount of amortisation (in this case reducing the LTV by 6 percentage points over the term) had minimal benefit in reducing default risk.

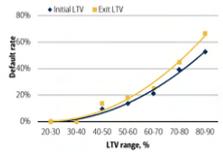
At higher LTVs the benefit of amortisation is more apparent and exit LTV outperforms initial LTV as a predictor of default. When the initial LTV was above 80%, the loan defaulted 53% of the time, in our sample, but when the exit LTV was above 80% the default rate rose to 66%. Similarly when initial LTVs were between 70% and 80%, the default rate was 40%, compared to 45% when the exit LTV was between 70% and 80%.

**Exhibit 34: Distribution of initial and exit LTVs - All Europe**  
Exit LTV is 6.5 percentage points less than initial LTV on average



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

**Exhibit 35: Comparison of defaults by initial and exit LTV**  
Exit LTV reveals higher default rates



Source: Trepp, BofA Global Research  
BofA GLOBAL RESEARCH

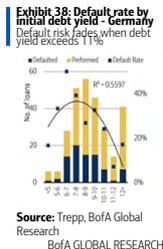
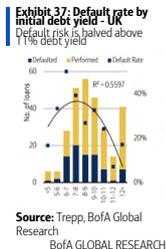
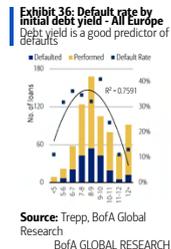
## Debt yield

Debt yield is a leverage metric that avoids estimating the property's value by directly comparing cash flow to loan amount. It

is calculated by dividing a property's net operating income by the loan amount. The higher the debt yield, the lower the leverage.

We found debt yield to be a good predictor of defaults but a poor predictor of loss severity. Not surprisingly, the higher the debt yield, the less likely the loan was to default.

We observed a tipping point in performance at a debt yield of around 11%. The aggregate default rate was 33.2% among loans with a debt yield of less than 11% and 12.4% at or above 11%. In the UK and Germany we observed similar relationships with tipping points at around 11%.



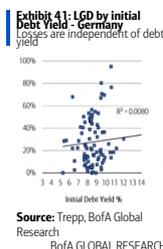
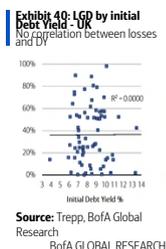
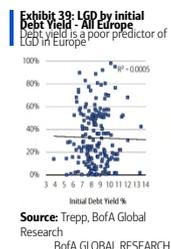
This finding does not mean that a 12% debt yield is always safer than an 8% debt yield, in our view, because a high rental yield underlying a higher debt yield could be concealing relatively poor property quality or short remaining lease term. We are not able to incorporate these factors in our analysis although we think they should be considered in conjunction with debt yield. Debt yield, loan-to-value and interest coverage ratios should be considered together to assess leverage and risk.

Interestingly, in some cases defaults decreased at lower debt yields, as illustrated above. Among the (relatively few) loans with debt yields below 6%, the default rate was 26%, which compared to default rates of 36% among loans with debt yields between 6%-7%, 35% between 7%-8% and 32% between 8% and 9%. Where lenders make loans with particularly low debt yields we think there may be aspects of the loan or property that enhance its credit quality that is not reflected in the debt yield.

This point is illustrated by two loans with debt yields of 1.8% and 3.9%, which were fully repaid. In the former, the property had significant value as a redevelopment opportunity, which was not reflected by its then-current rental income and debt yield. In the latter case, the loan was secured by a prime office building located in the centre of Paris that was valued at a gross initial yield of 3.69% in 2006 when five year government bonds were yielding 3.7%. We conclude that debt yield may be less useful as an indicator of credit risk in the case of high quality property (ie those valued at low yields) and properties with significant option value that is not expressed in its rental income.

At the high end of the spectrum, the £4.2mn MPH loan was made in 2005 and secured by a £7.8mn industrial property located outside Glasgow, Scotland. Initially the loan had a debt yield of 13.5% based on net rent of £565,400 pa from the unrated sole tenant, John McGavigan Limited. The tenant entered administration in 2009 and the borrower subsequently defaulted. The property was sold in 2018 for a 42.4% principal loss. Again, this illustrates the risk posed by properties that are occupied by a single tenant, particularly when the tenant is of relatively low credit strength.

We found debt yield to be a poor predictor of Loss Given Default as illustrated below.

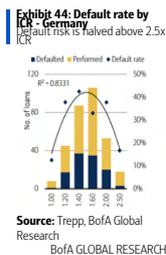
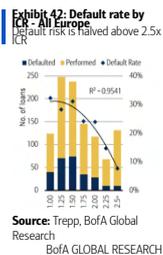


## ICR

We found interest cover ratios (ICR) to be a good predictor of defaults but a poor predictor of loss severity. The higher the ICR the less likely loans were to default.

The tipping point for defaults seems to be at the 2.5x ICR level, although we find notable improvements above the 2.0x ICR

level. At or above 2.5x the default rate was 7.6% while below 2.5x the aggregate default rate was 27.3%. At or above 2.0x the default rate was 15.2% compared to 29.0% below 2.0x. At the low end of the spectrum, among loans with an initial ICR of 1.5x or less, 29.6% defaulted.



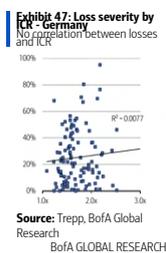
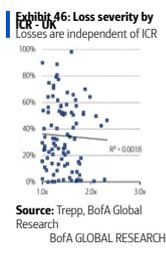
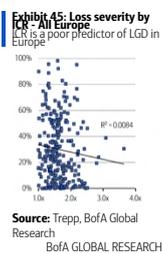
We observed the same relationship in the UK although we find less improvement in ICRs between 2.0x and 2.5x. Increasing from ICRs of 1.75x to 2.0x to 2.25x made little difference to default rates of ca. 17%. Above 2.5x the default rate halved to 7.4%. We think longer leases in the UK (compared to some continental jurisdictions) may contribute to the stickier ICR performance in the UK via more stable rental income.

In Germany the tipping point was more pronounced at the 2.5x ICR. Almost 38% of loans with initial ICRs between 2.0-2.5 defaulted (compared to 16% in the UK) while above 2.5x the default rate dropped to 16.7%.

It may not always be practical to make loans with ICRs above 2.5 as many borrowers have tended to seek higher leverage, we think. At lower ICRs we observe little improvement in default rates for marginally improved coverage. Rather than initial ICR we think lenders could focus on the stability of the ICR by selecting properties with granular pools of tenants (with limited exposure to any single business) or higher credit quality tenants, or both. In other words, a loan with a highly stable ICR of 1.2 may be better than a volatile initial ICR of 2.0.

Including mezzanine debt in this ICR analysis could reveal more lessons. For instance, the CityPoint loan was advanced in 2007 with a senior portion that was securitised and a junior portion that was not securitised and is not captured in our data. The senior ICR was 1.23x while the whole loan ICR was 0.96x. The loan subsequently defaulted although the securitised loan was fully repaid.

We found ICR to be a poor predictor of loss severity as illustrated below.



## Idiosyncratic factors

We found loss severity rates to be difficult to predict and we suspect that idiosyncratic factors were probably responsible for a significant proportion of the losses experienced. There may be little correlation between a loan's credit metrics when it is originally underwritten and the problems it suffers years later.

Property-specific causes such as tenant defaults or non-renewal of leases can be more destructive to property value than systematic causes such as a sector-wide shift in risk premia or property yields or a decrease in the availability of debt, in our view.

Some loans will have incurred swap break costs, which typically ranked ahead of principal recoveries and can significantly exacerbate losses, in our observation. We were not able to identify which loans incurred swap break costs or to what degree they increased the loss severity as these amounts were not always reported by special servicers.

Anecdotally, we have seen some instances where swap break costs represented a significant portion of the total loan amount.

The magnitude of the swap break cost is a function of the prevailing interest rates and the term remaining on the swap contract, and so is dependent on the timing of the default rather than the credit characteristics of the loan.

In the post-GFC lending environment, we think swap break costs are likely to be less of a concern because interest rate caps are more commonly used now, the strike rate on outstanding swaps is likely below market levels based on the recent rise in interest rates, and hedging is typically co-terminous with loan maturities, in our observation.

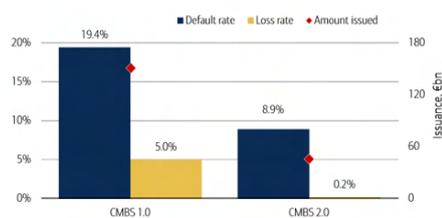
## New lessons post-GFC?

To date, we have observed 15 defaults in loans securitised after the GFC, representing €4.3bn in aggregate by initial principal amount. A further two loans narrowly avoided default when terms were altered to avoid recognising breaches that had occurred. This equates to an aggregate default rate of 9.3% among the €45.6bn of CMBS 2.0 loans securitised since 2011. Five of the defaults were subsequently fully repaid and one suffered a principal loss. Four subsequently returned to performing status having been cured by sponsors and/or waived by servicers. Five remain unresolved and principal losses look likely in some cases, while new defaults (and losses) could arise, we think.

These figures compare favourably with US loans, according to BofA's latest [Conduit Loss and Default Study](https://rsch.baml.com/r?q=uV77eRGueMIBdKnBaNzzrA) (<https://rsch.baml.com/r?q=uV77eRGueMIBdKnBaNzzrA>), published 21 February. Among loans securitised in US conduit CMBS transactions since the GFC, the cumulative default rate is 10.8% in aggregate. Post-GFC defaults were most common in US loans backed by hotel (22.7%) and retail (15.4%) properties, which is consistent with Europe. A summary of US default and loss rates is included at the end of this report.

We see evidence that the lessons learned from defaults in CMBS 1.0 may be helping to minimize defaults in CMBS 2.0 transactions while new causes of defaults may be emerging.

**Exhibit 48: Defaults in CMBS pre and post-GFC**  
Fewer defaults and losses among loans advanced post-GFC



Source: Trepp, BofA Global Research

BofA GLOBAL RESEARCH

In the above analysis we see that leverage was a key driver of performance among loans issued prior to the GFC. We observed pronounced 'tipping points' beyond which levels default rates increased sharply: at 60% LTV, 11% debt yield and 2.5x ICR.

Looking at the post-GFC loans that defaulted prior to the pandemic, few did not conform to these metrics, as shown in the table below, which suggests that leverage may not be the chief culprit for 2.0 loan defaults. Indeed, five of the defaulted loans have been fully repaid and we think their conservative leverage likely contributed to the successful outcomes. For example, in the case of the **Orange loan** default, the properties were sold well below their original valuations and the proceeds were sufficient to redeem the loan.

To date, the only loan from a post-GFC vintage that has suffered a loss was the **Debussy Toys 'R' Us** transaction, which defaulted in 2018 following the insolvency of the sole tenant, Toys 'R' Us. The properties were sold and the loan realised a 25% loss. However, Debussy was a distressed restructuring of a defaulted pre-GFC transaction and does not represent a new financing of performing assets, in our view. As such, we view it more as a CMBS 1.0 transaction than a 2.0 transaction.

Five of the 15 defaults among 2.0 loans occurred at maturity, so-called balloon defaults. This is a reversal of the defaults of pre-GFC loans which occurred at maturity over 80% of the time. Three of these loans have subsequently been fully repaid: the Orange loan in Deco 2014-Tulip, the **Silverback** loan and the **Devonshire Square** loan in TAURS 2018-UK2, while two remain unresolved, FROSN and River Green.

In the case of the **River Green** loan, which is backed by a single Grade A office building in Paris, River Oest, the servicer declared the loan to be in default when it failed to repay at its January 2024 maturity date despite the maturity being subject to a 1y extension option. It was not disclosed which conditions were not satisfied to exercise the 1y extension to our knowledge.

The bulk of 2.0 loan defaults occurred during the loan term for reasons relating to tenants, debt service and breaches of

financial covenants or other technical breaches. Whereas the main challenge during the GFC was the systematic decline in asset values and lack of refinancing available, the shock caused by the pandemic caused sharp declines in rental collections and debt service for some borrowers. Going forward, challenges in refinancing caused by recent sharp rise in interest rates could lead to more balloon defaults.

**Exhibit 49: Characteristics of defaulted CMBS 2.0 loans**

Covid closures led to defaults, particularly for shopping centres and hotels. Higher rates could cause more balloon defaults going forward.

Closing Date	Loan Name	Ticker	Amount mn	Date of Default	Cause of Default	Country	Property Type	Initial/Exit LTV %	Debt Yield	Initial ICR	Outcome
Jul-2013	Toys 'R' Us	DBSSV 1X	£ 263.2	Feb-2018	Toys 'R' Us insolvency	UK	Retail	83.5/83.5	7.6%	133%	25.3% loss
Dec-2017	Maroon	ELIZA 2018-1	£ 63.1	May-2019	LTV covenant	UK	Shopping Centre	66.5/63.2	12.3%	320%	Pending
May-2014	Orange	DECO 2014-TLFX	€ 124.5	Jul-2019	Balloon default	NLD	Retail	60.5/54.5	12.2%	290%	Redeemed
Jun-2019	Emerald	EMERA 2019-IT	€ 68.3	Jun-2020	Interest payment default	ITA	Shopping Centre	65.5/59.0	12.6%	163%	Pending
Sep-2019	Derby	DECO 2019-RAM	€ 45.6	Jul-2020	Intu insolvency	UK	Shopping Centre	42.7/42.7	16.0%	450%	Cured
Nov-2013	Metrocentre	MTROFN	€ 597.3	Oct-2020	Interest payment default	UK	Shopping Centre	55.1/55.1	8.9%	219%	Pending
Dec-2019	Atlas	EURO 37X	€ 307.4	Nov-2020	Debt yield covenant	UK	Hotel	62.4/58.6	13.4%	Not reported	Cured
Jun-2015	Silverback	SLVBCK	€ 1,344.8	Feb-2022	Non-payment of principal	ESP	Bank Branches	82.6/0	Not reported	Not reported	Redeemed
Nov-2021	Zamek	STARZ 2021-1X	€ 24.7	Apr-2022	ICR covenant breach	UK	Multifamily Student	73.6/73.6	5.9%	130%	Waived
Feb-2020	NBH	STARZ 2021-1X	€ 29.4	Jan-2023	DSCR covenant breach	UK	Housing	69.3/65.9	7.9%	135%	Redeemed
Jun-2019	Sellar	STARZ 2021-1X	€ 26.8	Jan-2023	DSCR, LTV covenant breach	UK	Hotel	79.9/75.8	12.5%	205%	Waived
Apr-2018	FROSN	FROSN 2018-1	€ 267.3	Mar-2023	Balloon default	FIN	Office/Retail	66.6/66.6	10.2%	417%	Pending
Mar-2020	FAH	STARZ 2021-1X	€ 38.1	Apr-2023	ICR covenant breach	UK	Social housing	59.5/59.5	6.9%	146%	Redeemed
Apr-2018	Devonshire Square	TAURS 2018-UK2	€ 485.0	May-2023	Balloon default	UK	Office	44.3/44.3	6.9%	595%	Redeemed
Dec-2019	River Green	RGRNF 2020-1	€ 177.9	Jan-2024	Balloon default	FRA	Office	57.2/53.7	12.0%	218%	Pending
Total			€ 4,261.9								

Source: Trepp, BofA Global Research

BofA GLOBAL RESEARCH

As we discussed in another report, loan extensions have been employed frequently recently and were the most common outcome among the 18 loans (<https://rsch.baml.com/r?q=1!!5y4ztOLW1wCOMTaQQZA>) that were due to mature in 2023. We expect more extensions are likely this year.

Despite the differences between the GFC, the Covid pandemic, and the current environment we think the lessons learned from CMBS 1.0 are helping this time around. For instance, annual valuations can make it possible to detect declines in property valuations, which may trip an LTV covenant and allow lenders to take protective measures. By contrast, in some 1.0 transactions valuations were not updated until loans were materially underwater and losses became unavoidable.

Six of the 2.0 loan defaults have involved loans backed by **retail property** of prime and non-prime quality. Retail property has been going through a period of transition, as rents rebase to new (lower) levels reflecting the shift in consumer behaviour and rise in e-commerce in some markets. This evolution is more developed in the UK where online shopping penetration is highest. Capital values of prime UK shopping centres declined by 60% since 2017, according to CBRE. Losses look likely for the **Maroon** loan when the properties are eventually sold, we think.

Shopping centre operator Intu Properties appointed administrators over the Group in 2020, which affected £2.5bn of CMBS in four propco subsidiaries. The Derby loan, which backs **Deco 2019-RAM**, defaulted and was supported by JV partner, Cale Street, who bought Intu's stake in the asset and injected equity. As a result, the LTV and ICR improved to 21% and 582% respectively and we think ultimately the loan is likely to be fully repaid.

The **Metrocentre** loan suffered an interest payment default in October 2020 when revenue declined following Covid-imposed closure. Since then PIK interest has added £110mn to the debt, the £20mn liquidity facility has been fully drawn and principal losses look likely, we think.

Similarly, £1,150mn of **Intu SGS** loans did not receive interest payments in September 2020. Default was avoided, however, owing to a consensual restructuring by noteholders the previous month, which allowed interest to PIK and so avoided recognising a default. As such, SGS is not included among the defaulted loans in our analysis. Nevertheless, S&P downgraded the debt to 'D' in response to the non-payment. In Dec 2023 the properties were valued at £858mn and we think principal losses look likely.

**Emerald Italy** suffered payment defaults in June and September 2020 and the loan was transferred into special servicing.

Coupon shortfalls affected the class D notes, which are not covered by the liquidity facility and are subject to an available funds cap, in our understanding. The loan has not been enforced and the shopping centres remain operational.

**Helios (EURO 37)** breached its debt yield covenant in October 2020 as we had anticipated (<https://rsch.baml.com/r?q=ulbSBshsqgOSimYyTfeyLA>). Special servicing fees led to coupon shortfalls on the class E notes, which do not have access to the liquidity facility and are subject to an available funds cap. Waivers were granted in exchange for an equity injection in 2021 and the loan is now in compliance. In our latest analysis, we projected the loan would likely be repaid in full (<https://rsch.baml.com/r?q=U!HnzLMCjRsl63lh7tSXw>).

**Silverback Finance** was a €1.4bn sale and leaseback of Santander bank branches in Spain. In 2020 Santander brought the borrower back on balance sheet, which caused the loss of its SOCIMI status and triggered a default under the transaction docs in our understanding. In response, Santander undertook to repay the loan but the repayment was held up, despite the funds being available, pending disagreement over whether prepayment fees were owing, which was subsequently brought to the courts and remains unsettled, in our understanding. According to Bloomberg, the notes have been redeemed and we attribute nil loss to Silverback Finance.

**FROSN** defaulted when it failed to repay at its maturity date in March 2023 after noteholders rejected a proposal to restructuring the debt including extending the maturity date. In December 2023, noteholders approved a restructuring including extending the maturity to 2026 with an option to extend to 2027. As a result, the loan is now performing, which allows Sponda flexibility to pursue property disposals over the next two years. In response to the restructuring, DBRS affirmed the junior ratings at B(low) suggesting an anticipated par recovery we think.

Four of the defaulted loans, **Zamek, NBH, Sellar, and FAH** were securitised in a CRE CLO rather than a CMBS transaction. The properties in CRE CLOs tend to be less stabilised than CMBS properties. The four defaults were triggered by covenant breaches and two loans subsequently have been redeemed.

Lastly, the borrower of the loan backing **Haus (ELoC 39)** defaulted on its obligations under a rent guarantee this year but a waiver from the servicer avoided a default of the loan. As such, Haus is not included among the defaulted loans in our analysis. We continue to anticipate full repayment of Haus in 2027 or 2028 (<https://rsch.baml.com/r?q=tEOzEWghwG8z33tMkOB67g>).

The stress from the pandemic and recent rise in interest rates have resulted in far fewer defaults than the GFC, which we attribute to several factors:

- the smaller outstanding volume of CMBS loans today,
- the lower leverage of loans since the GFC, and
- the forbearance shown by servicers to keep loans in primary servicing.

Indeed, the use of forbearance in reaction to a temporary systemic shock has been one of the main lessons from the pandemic, in our view. The lower leverage used post-GFC has meant that sponsors have continued to have significant equity interests to protect when defaults occurred, unlike the GFC when sponsors were often left with negative equity. We attribute this situation to making forbearance a viable and often successful option for borrowers and creditors. Forbearance actions have included waiving covenants, delaying new property valuations and extending loan maturity dates amongst other measures. In some cases, servicers have negotiated equity injections from sponsors, which further benefitted creditors.

## Conclusions

Overall, we found vintage and financial leverage to be good predictors of loan defaults while vintage but not financial leverage was a reasonable predictor of loss given default. That is, large changes in property values can be a source of defaults, which we can try to identify by vintage analysis.

We attribute the importance of vintage in the study to the concentration in the data of loans made leading up to 2007 when property values were increasing sharply and subsequently corrected sharply in some markets. A weakening of underwriting standards at the peak of the market may also have contributed to the poorer performance of the 2006 and 2007 vintages, we think, although this is difficult to quantify.

Owing to the difficulty of anticipating the timing of property cycles, however, we think vintage analysis may be of limited value in practice. By contrast, we think leverage metrics are better predictors of default through a downturn irrespective of the property cycle. Among the most at-risk loans - those from the 2005 to 2007 vintages - LTV, debt yield and ICR were good at predicting which loans would perform and which would suffer a loss.

For each leverage metric we observed a 'tipping point' beyond which default rates increased markedly: initial LTVs and exit LTVs in excess of 60%, debt yields below 11%, and ICRs below 2.5x.

Importantly, we did not observe a notable increase in LTVs leading up to 2007. Rather, we think leverage was increasing through rising property values. This suggests to us that for lenders to size debt appropriately they need to take into account the potential volatility of property valuations. Normalised or sustainable valuations could provide a better measure of long-term property value than spot valuations. We also see more focus on debt yield now than prior to the GFC, as a more stable metric for sizing debt.

Loss given default is more difficult to predict. Where loans defaulted, we found LTV, debt yield and ICR to be poor predictors of the loss severity. Underwriting should focus on avoiding defaults rather than minimising losses, in our view.

We suspect idiosyncratic problems are probably responsible for a large portion of losses and are difficult to anticipate when underwriting a loan.

Property-specific problems such as tenants defaulting or not renewing leases can be more destructive of property value than systematic causes such as a sector-wide increase in property yields or a decrease in the availability of debt, we think.

Also, as discussed above, swap break costs can exacerbate losses to a significant degree, which may be unrelated to the credit characteristics of the loan, in our view. Going forward, we think swaps are likely to be less problematic because interest rate caps are more commonly used now than in the past. Rising interest rates could create new risks for users of swaps.

Looking at the defaults that have occurred among the €46bn of loans securitised after the GFC, we found that exposure to the retail sector, not over-leverage, has been a common challenge that led to a number of defaults in the UK. The penetration of online shopping has lagged in continental jurisdictions and more markets are likely to repeat the experience of the UK over the medium term, we think. In the office sector, remote working is driving similar structural change. Three defaults in the past year were in the office sector, including River Green earlier this year. Higher interest rates pose a refinancing challenge for many outstanding loans and we expect to see more extensions and defaults this year.

The Covid pandemic resulted in fewer defaults than might have been anticipated at the outset. As mentioned, we think the loan servicers deserve much of the credit for the proactive measures they have taken to avoid defaults in many cases. In addition, the better performance of 2.0 loans may also reflect the improvements made to CMBS based on the lessons learned during the GFC. As well as the reduction in leverage and other changes noted above, we think the requirement that lenders retain a 5% stake in loans may also play a role, although this is difficult to quantify.

In the future, we think it would be useful to analyse the effect of property quality on default rates, as well as the degree to which various factors (such as property yield shift, tenant defaults, swap break costs, liquidation fees, etc) have contributed to loss severity. These data were not available to us. Direction from regulators could be helpful, and probably necessary, to collect these data at an industry level, in our view.

Finally, this report focussed on defaults and losses on loans but from a CMBS perspective it is interesting to note that occasionally CMBS notes may suffer a partial shortfall even where the borrower has made all payments due on the loan. This can arise where some senior costs are not reimbursed by the borrower or where prepayments lead to the average loan margin in a deal falling below the average note coupon in the CMBS. The affected notes are usually the most junior ranking, are often subject to available funds caps and may have credit ratings that are below investment grade. Examples include the class E notes of Deco 2015-Charlemagne and the class E notes of Helios (European Loan Conduit No. 37).

## Related research

Finally, we provide for reference the following links to related research on the historical performance of securitised CRE debt in Europe. The data show that the reality is different from the perception held by some industry participants.

### AAA losses total 0.3%

With respect to credit performance, in our analysis of all AAA rated notes issued in Europe from 1995 to 2020 (totalling €174bn), losses amounted to 0.3% in aggregate (<https://rsch.baml.com/r?q=m7ZVVTWFzJB3RVoXFXGf6g>) over the 25 year period. All of the affected triple A notes were from bank conduit transactions.

In the wake of the GFC, the rating agencies have reduced the amount of leverage that qualifies for the AAA rating by roughly 30% we estimate.

### Price volatility

The liquidity and volatility of securitised bonds is not materially different (<https://rsch.baml.com/r/>)

[q=c3WEJtDOOsweFkjt2kcnw](#)) from similar corporate bonds, in our assessment.

In a comparison of monthly returns from 1996 to 2017 of three Sterling indices composed of (i) Corporate bonds, (ii) Securitised bonds, and (iii) bonds issued by REITs, we found that volatility was lowest among the corporate bonds with an annualised standard deviation of 5.23, followed by the securitised bonds at 6.61 and the bonds issued by REITs at 7.44.

The securitised bonds experienced one-third the number of extreme negative movements (greater than three standard deviations) that the corporate bonds experienced over the period.

**Do securitised loans outperform bank loans?**

Data released by the Bank of England show that UK banks have written off 10% of their CRE loan holdings since 2008, compared with 4% for securitised loans (<https://rsch.baml.com/r?q=t1UA2q2lyGZdgvFNI58M5g>) over the same period.

# US CMBS loan data: cumulative default, liquidation and loss rates by vintage

**Exhibit 50: Cumulative Default and Loss Rates by Vintage**  
Loans originated between 2005 and 2008 continue to post the highest default and loss rates

Vintage	Orig. Loan Count	Orig. Bal (\$bn)	Cum Default Bal (\$bn)	Cum Default Rate (%)	Cum Liq Balance (\$bn)	Cum Liq Rate (%)	Cum Losses (\$bn)	Cum Loss Rate (%)	Loss Sev (%)
2000	4,913	29.5	5.7	19.3%	4.4	15.0%	1.4	4.7%	31.2%
2001	5,128	35.6	7.0	19.7%	5.5	15.4%	1.8	5.2%	33.6%
2002	4,500	36.1	5.1	14.2%	3.8	10.5%	1.4	3.8%	36.4%
2003	6,001	54.9	7.0	12.8%	4.3	7.8%	1.6	2.9%	36.6%
2004	6,701	73.5	12.9	17.5%	8.2	11.2%	3.0	4.1%	36.2%
2005	10,117	135.4	33.8	24.9%	23.5	17.4%	9.1	6.7%	38.5%
2006	11,703	161.6	50.2	31.1%	39.2	24.3%	17.3	10.7%	44.1%
2007	11,572	189.9	70.1	36.9%	57.2	30.1%	22.7	12.0%	39.8%
2008	819	10.7	4.3	40.6%	3.5	32.3%	1.6	15.0%	46.5%
2010	211	5.1	0.8	16.4%	0.4	8.7%	0.1	2.5%	28.8%
2011	967	24.5	3.8	15.6%	1.2	5.1%	0.3	1.3%	26.5%
2012	1,719	32.1	5.8	18.1%	2.4	7.4%	0.9	2.7%	36.1%
2013	3,051	53.0	11.0	20.7%	1.6	3.1%	0.6	1.2%	37.7%
2014	3,484	56.7	8.4	14.7%	2.7	4.8%	1.1	2.0%	41.5%
2015	4,330	61.5	7.7	12.5%	2.0	3.2%	0.4	0.6%	18.6%
2016	2,800	47.1	6.6	13.9%	1.4	3.0%	0.2	0.4%	14.5%
2017	2,510	48.2	4.7	9.7%	0.7	1.5%	0.1	0.3%	17.5%
2018	2,249	40.3	4.8	11.8%	0.5	1.1%	0.0	0.1%	7.3%
2019	2,613	48.3	2.1	4.2%	0.1	0.2%	0.0	0.0%	6.6%
2020	1,409	28.9	0.4	1.3%	0.0	0.0%	0.0	0.0%	0.0%
2021	1,801	31.2	0.1	0.3%	0.0	0.0%	0.0	0.0%	0.0%
2022	1,203	23.4	0.1	0.3%	0.0	0.0%	0.0	0.0%	0.0%
2023	796	19.9	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0%
<b>Grand Total</b>	<b>90,597</b>	<b>1,247.5</b>	<b>252.2</b>	<b>20.2%</b>	<b>162.7</b>	<b>13.0%</b>	<b>63.7</b>	<b>5.1%</b>	<b>39.1%</b>
2000-2004	27,243	229.6	37.7	16.4%	26.2	11.4%	9.1	4.0%	34.9%
2005-2008	34,211	497.6	158.4	31.8%	123.4	24.8%	50.7	10.2%	41.1%
Post-GFC	29,143	520.4	56.1	10.8%	13.2	2.5%	3.8	0.7%	29.0%
<b>Grand Total</b>	<b>90,597</b>	<b>1,247.5</b>	<b>252.2</b>	<b>20.2%</b>	<b>162.7</b>	<b>13.0%</b>	<b>63.7</b>	<b>5.1%</b>	<b>39.1%</b>

Source: Intex  
Note: Loss Severity calculated as % of liquidation amount. Default defined as ever 90+ day delinquent.

BofA GLOBAL RESEARCH

**This document is intended for BofA Securities institutional investors only. It may not be distributed to financial advisors, retail clients or retail prospects. BofA Securities does and seeks to do business with issuers covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.**

[Click for important disclosures.](#)

## Disclosures

### Important Disclosures

Due to the nature of strategic analysis, the issuers or securities recommended or discussed in this report are not continuously followed. Accordingly, investors must regard this report as providing stand-alone analysis and should not expect continuing analysis or additional reports relating to such issuers and/or securities.

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.

BoFA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

## Other Important Disclosures

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for any recommendation in relation to an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report and in relation to a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BoFA Securities trading desks.

The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

This report may refer to fixed income securities or other financial instruments that may not be offered or sold in one or more states or jurisdictions, or to certain categories of investors, including retail investors. Readers of this report are advised that any discussion, recommendation or other mention of such instruments is not a solicitation or offer to transact in such instruments. Investors should contact their BoFA Securities representative or Merrill Global Wealth Management financial advisor for information relating to such instruments.

Rule 144A securities may be offered or sold only to persons in the U.S. who are Qualified Institutional Buyers within the meaning of Rule 144A under the Securities Act of 1933, as amended.

SECURITIES OR OTHER FINANCIAL INSTRUMENTS DISCUSSED HEREIN MAY BE RATED BELOW INVESTMENT GRADE AND SHOULD THEREFORE ONLY BE CONSIDERED FOR INCLUSION IN ACCOUNTS QUALIFIED FOR SPECULATIVE INVESTMENT.

The securities or other financial instruments discussed in this report may be traded over-the-counter. Retail sales and/or distribution of this report may be made only in states where these instruments are exempt from registration or have been qualified for sale.

Officers of BoFA or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.

This report, and the securities or other financial instruments discussed herein, may not be eligible for distribution or sale in all countries or to certain categories of investors, including retail investors.

### Information relating to Affiliates of BoFA, MLPF&S and Distribution of Affiliate Research Reports:

Refer to [BoFA Global Research policies relating to conflicts of interest \(https://rsch.baml.com/col\)](https://rsch.baml.com/col).

**"BoFA Securities" includes BoFA Securities, Inc. ("BoFA") and its affiliates. Investors should contact their BoFA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BoFA Securities" is a global brand for BoFA Global Research.**

BoFA and/or Merrill Lynch, Pierce, Fenner & Smith Incorporated ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BoFASE (France): BoFA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF). BoFA Securities Europe SA ("BoFASE") with registered address at 51, rue La Boétie, 75008 Paris is registered under no 842 602 690 RCS Paris. In accordance with the provisions of French Code Monétaire et Financier (Monetary and Financial Code), BoFASE is an établissement de crédit et d'investissement (credit and investment institution) that is authorised and supervised by the European Central Bank and the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers. BoFASE's share capital can be found at [www.bofam.com/BoFASEdisclaimer](http://www.bofam.com/BoFASEdisclaimer) (<http://www.bofam.com/BoFASEdisclaimer>); BoFA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BoFA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BoFA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Canadian Investment Regulatory Organization; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; BoFA Japan: BoFA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BoFA India: BoFA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority. This information has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BoFASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BoFA Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSF; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BoFA India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BoFA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BoFA Securities entities, including BoFA Europe and BoFASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BoFA Securities group. You may be contacted by a different BoFA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please refer to the [Electronic Communications Disclaimers \(http://www.bankofamerica.com/emaildisclaimer\)](http://www.bankofamerica.com/emaildisclaimer) for further information.

This information has been prepared and issued by BoFA and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BoFA and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BoFA and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BoFA and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information. For clients that are not accredited investors, expert investors or institutional investors Merrill Lynch (Singapore) Pte Ltd accepts full responsibility for the contents of this information distributed to such clients in Singapore.

### General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BoFA Securities.

This document provides general information only, and has been prepared for, and is intended for general distribution to, BoFA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BoFA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. Digital assets are extremely speculative, volatile and are largely unregulated. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial

instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

This report may contain a trading idea or recommendation which highlights a specific identified near-term catalyst or event impacting a security, issuer, industry sector or the market generally that presents a transaction opportunity, but does not have any impact on the analyst's particular "Overweight" or "Underweight" rating (which is based on a three month trade horizon). Trading ideas and recommendations may differ directionally from the analyst's rating on a security or issuer because they reflect the impact of a near-term catalyst or event.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned in this report. Investors in such securities and instruments effectively assume currency risk.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

#### Copyright and General Information:

Copyright 2024 Bank of America Corporation. All rights reserved. iQdatabase® is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies.

Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

Terms of Use (<https://rsch.baml.com/WebReports/TermsOfUse.pdf>) | Privacy & Security: [GBAM \(https://www.bofam.com/en-us/content/global-privacy-notices.html\)](https://www.bofam.com/en-us/content/global-privacy-notices.html) [GWIM \(https://www.bankofamerica.com/privacy/privacy-overview.go\)](https://www.bankofamerica.com/privacy/privacy-overview.go) | [Cookie Policy \(https://www.bofam.com/content/dam/boamlimages/documents/articles/ID19\\_0760/Cookie\\_Policy.pdf\)](https://www.bofam.com/content/dam/boamlimages/documents/articles/ID19_0760/Cookie_Policy.pdf) | [GBAM Digital Privacy Notice \(https://business.bofa.com/content/dam/flagship/gbgmr/global-privacy-notices/BofA-Institutional-Digital-Privacy-Notice.pdf\)](#) | [GDPR Privacy Notice \(https://www.bofam.com/gdpr\)](https://www.bofam.com/gdpr) | [Your Privacy Choices](#)