



The rise of non-bank financial intermediation in real estate finance

Post-COVID-19 trends, vulnerabilities and policy implications



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This report contributes to the work of the OECD Committee on Financial Markets which seeks to promote the contribution of financial institutions, including institutional investors, and capital markets to facilitate savings and investment, and finance sustainable and inclusive economic growth. It contributes to the enhancement of policy approaches in the financial sector, such as to promote efficient and transparent public and private debt markets. For more information, visit www.oecd.org/finance/financial-markets/.

Executive summary

Since the Global Financial Crisis (GFC), the credit quality of structured real estate finance products has broadly improved, as securities are no longer backed by subprime and Alt-A collateral. In this regard, regulators have strengthened regulation and oversight to better address risks posed by securitisation. Also, national authorities and international organisations have made considerable progress to identify and better understand activities and risks in financial intermediation more broadly across the world. All these developments have contributed to more stable real estate finance markets in the last decade. However, very low interest rates in the aftermath of the GFC have led to a substantial rise in indebtedness of households and corporates concomitantly with real estate prices, which have risen above 2008 pre-crisis levels in many jurisdictions, which has in turn increased concerns over exuberance in residential and commercial real estate markets.

In parallel, investors' reach for yield over the last decade has supported the growth of non-bank leveraged institutions (such as non-bank mortgage originators) and forms of collective investment vehicles in real estate finance (including mortgage real estate investment trusts (mREITs) and real estate mutual funds (REMFs)). Such attractiveness of investments in mREITs and REMFs has contributed to an increase in demand for mortgage backed securities (MBS) and has supported the rebound of MBS issuance over the last decade. Against a backdrop of observed exuberance in some real estate markets, the rising importance of leveraged mREITs and REMFs that perform liquidity transformation could contribute to financial stability risks and ultimately disrupt the availability of finance to the real economy. In this regard, the COVID-19 crisis has posed unprecedented challenges for economic and financial resilience and the market turmoil in March 2020 has exposed structural fault lines in the non-bank financial sector. In particular, many mREITs and REMFs faced liquidity stress following significant outflows and difficulties to meet margin calls that resulted in the liquidation of assets in markets with little or no secondary trading. Therefore, the pro-cyclical behaviour and liquidity risks associated with mREITs and REMFs (which are subject to relatively weak liquidity requirements) combined with their increasing reliance on public support, demonstrate the need to further develop and implement activities-based tools to address vulnerabilities in some parts of the non-bank financial sector without undermining the benefits of market-based finance.

This report therefore offers an integrated assessment of the shift within non-bank financial intermediation in real estate finance from structured products to leveraged institutions and collective investment vehicles. The paper reviews the key trends in real estate finance since the GFC, activities and risks, with a focus on the implications of a prolonged period of low interest rates versus an abrupt path to rate normalisation on fragilities in the sector. In this sense, the report discusses policy considerations to help mitigate procyclicality and excessive risk taking in real estate markets by some entities in the non-bank financial sector.

Key findings

Real estate mortgage-backed securities (MBS) and covered bond markets

Froth in some housing markets and vulnerable commercial real estate markets make MBS markets prone to rating downgrades and rising defaults in the post COVID-19 environment. Household and corporate mortgage payment risks are likely to increase, which may erode the credit quality of underlying mortgage collateral of MBS. In addition to the possible pandemic-induced structural changes, commercial MBS

(CMBS) markets are also exposed to medium-term challenges related to climate transition risks that are likely to erode further the credit quality of some non-financial corporates. Also, hedging activities on MBS markets may trigger sell-offs of Treasury securities and heightened volatility in Treasury markets. Therefore, deteriorating conditions in several major MBS and Treasury markets may result in substantial losses for a wide range of financial intermediaries and investors with detrimental implications for financial resilience, as well as the availability of finance to the real economy and ultimately economic growth.

Covered bonds are debt instruments issued by a bank or a mortgage institution that are backed by collateral, including real estate mortgage loans and public sector debt instruments. The very low interest rate environment following the GFC and the covered bond purchase program implemented by the European Central Bank (ECB) have created favourable conditions and supported covered bond issuance in many jurisdictions. While covered bonds are a source of secured and low-cost funding, they may increase refinancing risks from unsecured wholesale funding sources for the issuer bank. Covered bonds require the issuer bank to maintain a cover pool of high quality assets backing the bonds. Since the asset pool backing the covered bonds is replenished, losses that surpass the bank's capital are likely to be concentrated on unsecured debt holders. Therefore, the more covered bonds a bank issues, the higher the riskiness of its unsecured obligors that may expose the bank to higher rollover risk due to short-term unsecured debt. Greater covered bond funding may thereby exacerbate bank liquidity risk and increase pressures on unsecured wholesale funding markets. Unprecedented monetary and fiscal supports combined with loan forbearance measures following the COVID-19 shock have helped to contain mortgage defaults in aggregate and preserve the resilience of covered bond markets. Notably, the negative credit impact on residential mortgage loans in the cover pool of assets backing the bond has been limited. In addition, the impact on the performance of commercial real estate assets may be more severe but cover pools' exposures are limited.

Mortgage real estate investment trusts and real estate mutual funds

While mREITs and REMFs can contribute to market liquidity under normal market conditions, they are vulnerable to margin calls and share redemptions following a shock in underlying real estate markets. mREITs use leverage to perform liquidity and maturity transformation by funding the acquisition of real estate MBS and mortgages with revolving credit facilities from banks and borrowing from short-term secured funding markets. REMFs invest using investors' funds in mREITs and provide liquid investments by offering redemptions at higher frequencies. mREITs may be subject to margin calls and may have to deleverage by unwinding their positions in MBS that could create feedback loops to MBS markets. During the first semester of 2021, REMFs recorded losses due to the deteriorating financial soundness of mREITs. The broad deterioration in the market liquidity of REMFs' assets was particularly severe for funds facing larger share redemptions from investors. Notably, REMFs attempted to use a liquidity waterfall strategy, to initially meet increased redemption demand using cash and cash equivalents. However, some REMFs ran out of cash and cash equivalents forcing them to sell real estate assets into increasingly illiquid markets. Developments at the onset of the pandemic have shown that structural vulnerabilities remain in mREIT and REMF products which have been deeply affected by and contributed to the price volatility in MBS markets. For these reasons, deteriorating credit quality of mortgages and business model of mREITs and REMFs make them prone to abrupt changes in investor risk sentiment that are exacerbated by elevated real estate prices, indebtedness and liquidity transformation of various types of stakeholders in the investment chain.

The rising importance of non-bank mortgage intermediation in real estate finance

The low interest rate environment in the aftermath of the GFC and more stringent regulation implemented in the banking sector have contributed to the development of leveraged non-bank mortgage originators and servicers, mainly in the United States that perform liquidity and maturity transformation. In addition, very low interest rates have contributed to heightened interest of insurance companies, pension funds and investment funds, especially in several European economies, for investing in real estate loans. Evidence

shows that insurance companies and investment funds are exposed to higher risk of losses from their commercial real estate investments while pension funds face moderate exposure to the real estate sector. While unprecedented monetary and fiscal support measures have mitigated the COVID-19 induced financial strain on non-bank mortgage lenders as well as their funding sources, any emergence of new COVID-19 variants combined with the uneven recovery across sectors could have detrimental implications for the asset quality of non-bank mortgage lenders in the absence of targeted income support for households and firms that operate in the most vulnerable sectors. Therefore, the main points of concern relate to non-bank mortgage lenders that are increasingly exposed to several types of shocks that may substantially disrupt mortgage markets and create spillovers to other markets and ultimately the real economy.

Policy considerations

The majority of segments of the global financial system have entered the COVID-19 crisis more resilient and better placed to sustain financing to the real economy as a result of regulatory reforms in the aftermath of the GFC. The implementation of the Basel III accords and the IFRS 9 accounting standards have provided some additional macroprudential tools targeted to banks aimed at strengthening their resilience against their real estate exposures. Nevertheless, the market turmoil in March 2020 has exposed vulnerabilities across non-bank financial intermediation, from types of investment vehicles to non-bank institutions that lend to or invest in forms of real estate. Consistent with the OECD Policy Framework for Effective and Efficient Financial Regulation, a sound assessment of risks and vulnerabilities of leveraged real estate NBFIs is crucial to help identify major problems and establish the case for intervention to issue relevant policy recommendations.

In light of the strains in these markets during the pandemic, a further assessment of the efficacy and use of activities-based tools for mREITs and REMFs, and also a more comprehensive risk-based approach for the regulatory framework of non-bank mortgage lenders and servicers, is warranted. The consideration of appropriate tools to address risks at leveraged real estate NBFIs would help mitigate excessive leverage, excessive liquidity transformation and further increase the transparency of real estate finance products and intermediaries. Authorities should also determine whether they have sufficient activities-based tools that incentivise leveraged real estate NBFIs to take heed of liquidity and maturity transformation risks.

Given that the renewed rise in interest rates could contribute to a sharp correction in real estate prices, the consideration of appropriate tools to address risks at real estate collective investment vehicles is prescient. As mREITs and REMFs grow in importance, it is crucial to mitigate their risks to strengthen resilience of the non-bank financial sector. This is the new frontier that must be crossed to make progress towards a more resilient global financial system.

1 Introduction

Exuberance in some real estate markets combined with the significant growth of real estate structured products, such as subprime residential MBS (RMBS), subprime collateralised debt obligations (CDOs), and related structured products, contributed to the GFC. Since then, the credit quality of mortgages underlying structured financial products has broadly improved. Importantly, structured real estate financial products, such as RMBS, are no longer backed by the type of subprime and Alt-A collateral that was widespread prior to the GFC. Also, regulators have strengthened regulation and oversight to better address risks posed by securitisation. All these developments have contributed to more stable real estate finance markets in the last decade. Nevertheless, the low interest rate environment in the aftermath of the GFC has contributed to reduce the cost and improve the availability of external funding for both households and non-financial corporations, including by boosting asset prices and cash flows (Patalano and Roulet, 2020). Against this backdrop, indebtedness of households and corporates has substantially increased in parallel with real estate prices, which have risen above 2008 pre-crisis levels in many jurisdictions, and raises concerns over exuberance in residential and commercial real estate markets.

In parallel, a profound structural shift within non-bank financial intermediation in real estate finance markets, from structured products to leveraged institutions and collective investment vehicles that perform liquidity transformation, has occurred in a number of jurisdictions since the GFC. The low interest rate environment over the last decade and investors' subsequent reach for yield have supported the growth of mREITs and REMFs. Notably, these financial intermediaries provide diversified and liquid real estate investments with attractive returns for investors seeking to boost their portfolio return. Such attractiveness of investments in mREITs and REMFs has contributed to an increase in demand for MBS and has supported the rebound of MBS issuance over the last decade. Concomitantly, more stringent capital requirements on mortgage lending activities under the Basel III regulatory framework have weakened banks' incentives to increase their lending and prompted the development of non-bank mortgage originators and servicers as an alternative to traditional bank mortgage lending. Therefore, real estate finance markets have become increasingly exposed to leveraged NBFIs with a relatively low degree of regulatory oversight compared to other financial institutions operating on mortgage markets, such as banks.

Against a backdrop of observed exuberance in some real estate markets, the rising importance of leveraged real estate NBFIs that perform liquidity transformation could contribute to financial stability risks and ultimately disrupt the availability of finance to the real economy. As shown by previous crisis episodes, financial distress of NBFIs could pose a substantial threat to the financial system, both directly and through their interconnectedness with the regular banking system. Notably, the use of short-term secured funding and/or bank warehouse credit lines to finance longer-term MBS and mortgages, that combined with leverage, exacerbate maturity mismatch and debt rollover risk. Also, the fact that mortgages originated by non-bank US mortgage lenders are of lower credit quality than those originated by banks may render real estate finance markets, mREITs and REMFs more susceptible to sharp swings in investors' credit risk aversion (Kim et al., 2018). In the event of a shock that negatively impacts credit quality of mortgages and raises investor concerns over real estate NBFIs, mREITs and REMFs are likely to experience margin calls and share redemptions. Subsequent deleveraging is likely to create feedback loops to MBS markets and losses for a wide range of financial intermediaries and investors exposed to these markets. Also, a substantial increase in defaults of real estate NBFIs is likely to trigger a significant contraction in mortgage

origination capacity as it is not clear if other financial intermediaries would extend credit. This drop in mortgage credit availability would likely dampen real estate prices that could erode macroeconomic performance and system-wide resilience.

The COVID-19 crisis has posed unprecedented challenges for economic and financial resilience and the market turmoil in March 2020 has exposed structural fault lines in the non-bank financial sector. In particular, many mREITs and open-ended REMFs faced acute liquidity stress following significant outflows and difficulties to meet margin calls that resulted in the liquidation of assets in markets with little or no secondary trading (ECB, 2021a and SEC, 2020b). Such procyclical behaviours contributed to pressure on asset valuations and market liquidity that resulted in tighter funding conditions in the real economy. Unprecedented monetary actions by major central banks combined with fiscal and loan forbearance measures have helped to contain mortgage defaults in aggregate that may have mitigated the COVID-19 induced financial strain on non-bank mortgage originators and servicers as well as their funding sources. Nevertheless, pro-cyclical behaviour and liquidity risks for leveraged real estate NBFIs that are subject to relatively weak liquidity requirements, together with their reliance on public support as seen in March 2020, demonstrate the need to further develop and implement activities-based tools to address vulnerabilities without undermining the benefits of market-based finance.

The analysis herein begins by considering the key structural shifts that occurred in the real estate finance sector over the last decade and several types of risks that are inherent to these products or business models. Given concerns over the rising vulnerabilities in the real estate finance sector, this section then assesses the extent to which the post-crisis growth of mREITs and REMFs in residential and commercial real estate sectors has contributed to exuberant valuations, which are prone to correction and spillovers. This report seeks to consider the fragilities in the current state of the real estate finance sector by considering the implications of a prolonged period of low interest rates versus a path to rate normalisation.

- The second section explores major developments in RMBS, CMBS and covered bond markets and the expansion of mREITs and REMFs. It also assesses the several types of risks that are inherent to these products or business models.
- The third section outlines the shifting structure of mortgage credit intermediation characterised by the rise of non-bank US mortgage lenders and servicers. It describes major global trends and assesses the main risks associated that may threaten financial resilience.
- The fourth section details the macroprudential policies that have been applied to banks in many jurisdictions since the GFC to strengthen their resilience against their real estate exposures. It also discusses the use of activities-based measures to help mitigate procyclicality and excessive liquidity transformation for mREITs and REMFs. Lastly, the section discusses the regulatory environment for non-bank US mortgage lenders and servicers aimed at strengthening resilience in the sector.

2 The rise of leveraged institutions and collective investment vehicles in real estate finance

This section describes major developments in RMBS, CMBS and covered bond markets and the rising importance of collective investment vehicles in real estate finance (such as REITs, mREITs and REMFs) in the post-GFC era. This section also provides an assessment of the several types of risks that are inherent to these products or business models that could lead financial authorities in many countries to consider where to alter regulations, combined with tightening in macro-prudential policy tools, to help strengthen resilience.

2.1. Real estate mortgage-backed securities markets

Despite improvements in the credit quality of structured real estate finance products and more stringent financial sector regulation following the GFC, the shift within non-bank financial intermediation in real estate finance from structured products to leveraged institutions and collective investment vehicles combined with exuberance in some real estate markets may cause risks to system-wide resilience

Since the GFC, the credit quality of structured real estate finance products and the associated underlying collateral have broadly improved as regulators have strengthened regulation and oversight to better address risks posed by securitisation and market-based finance (S&P Global Ratings, 2020a). Nevertheless, some mortgage credit exuberance may be detected in some major markets (Annex A). An OECD report by Van Hoenselaar et al. (2021) provides further empirical evidence and assessment of key risks on mortgage markets in the OECD from the perspective of households (Box 1). Notably, the indebtedness of households and corporates has substantially increased in parallel with real estate prices, which have risen above 2008 pre-crisis levels in many jurisdictions, which has in turn given rise to concerns over exuberance in residential and commercial real estate markets. The shift within non-bank financial intermediation in real estate finance from structured products to entities that are using leverage and perform liquidity transformation, while subject to less stringent solvency and liquidity regulations than in the banking sector, could cause risks to system resilience and ultimately undermine sustainable growth. In fact, tangible real estate assets as well as mortgages and real estate MBS are important sources of collateral. Therefore, a decline in real estate prices or a shock that implies a substantial deterioration of the credit quality of mortgage borrowers may cause MBS prices to decline implying losses and margin calls for a wide range of financial intermediaries and investors exposed to these markets. Deteriorating financial soundness of mREITs may force them to deleverage and liquidate real estate assets at fire sale prices that could amplify MBS price movements, transmitting stress to other parts of the financial system and disrupting the availability of finance to the real economy. Unprecedented monetary support combined with fiscal and loan forbearance measures following the COVID-19 crisis have helped tempered losses on residential mortgages and corporates in many jurisdictions. Nevertheless, the real estate finance sector

may be vulnerable to a rise in interest rates, as an economic recovery gains momentum, which could in turn contribute to stress in the financial system. In addition, maintaining fiscal stimulus could cause the vulnerabilities to increase further.

Box 1. Main messages from the report on Mortgage Finance Across OECD Countries

This box presents the main findings and policy considerations of the report on Mortgage Finance Across OECD Countries by Van Hoenselaar et al. (2021). The report draws a topography of differences across OECD economies in terms of mortgage structure and use from the perspective of households (i.e. focusing on the demand side of the market). It then discusses policies that may influence these outcomes and proposes a new indicator to measure the balance between the rights of borrowers and lenders. The report, which contributes to Phase II of the OECD Horizontal Project for More Affordable, Sustainable and Inclusive Housing by the Economics Department, is set for discussion by Working Party No. 1 on Macroeconomic and Structural Policy Analysis of the Economic Policy Committee at its October 2021 meeting.

The landscape of housing loan markets are very distinct across OECD countries. There are considerable differences in mortgage take-up across OECD economies. Within countries, the share of households with a mortgage is substantially lower for low-income households and young households. Several countries promote homeownership and mortgage access through tax subsidies (such as mortgage interest deduction) or other mortgage support schemes. However, as these subsidies become partly capitalised in house prices, they prove largely ineffective in improving housing accessibility and are often mostly benefit the upper-middle rather than the lower part of the income distribution.

Regulatory ceilings on loan-to-value (LTV), loan-to-income (LTI) or debt-service to income (DSTI) vary widely across OECD economies. Similarly, the extent of effective borrowing, measured by mortgage debt to income ratios, exhibits considerable cross-country differences. Several mortgage characteristics such as variable interest rates, foreign-currency payments and interest-only payments are common in some countries, widening the debt-related risk exposure of households.

Across OECD economies, there are many discrepancies in how borrower and creditor rights are balanced and how quickly insolvency is resolved. A new *Foreclosure Regulation Index* built for the report uncovers that mortgage markets are deepest in countries where the index shows that creditor and borrower rights are well balanced.

Against this background, the report discusses policy options to improve the functioning of mortgage markets, including measures to:

- Encourage inclusive access to good-quality housing by:
 - Eliminating mortgage interest deduction, which would help to curb house price pressures and boost long-term affordability while providing potentially significant additional tax receipts;
 - Shifting the focus from promoting mortgage-funded homeownership to improving affordable access to housing in an environment where tax and subsidy programmes gradually become neutral between rented and owner-occupied dwellings.
- Prevent the build-up of potentially destabilising levels of mortgage debt by:
 - Applying macroprudential brakes as DSTI and LTV-caps, which can limit household debt accumulation and limit house price appreciation;
 - Ensuring that lending standards properly account for the risks associated with variable rate and foreign-currency loans.

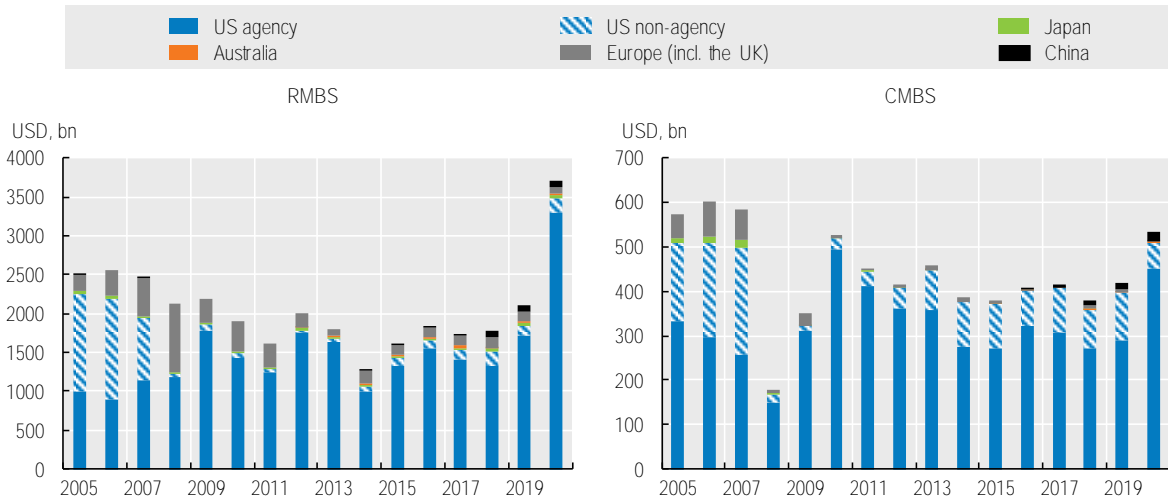
- **Align mortgage markets with environmental goals:** There is scope for progressing towards climate objectives through innovations in housing finance, such as the development of green mortgages. Policies can create a favourable environment for such advances by
 - Establishing international standards for energy-efficient, or “green”, mortgages;
 - Creating mechanisms to ensure the quality of the energy certification of dwellings;
 - Setting supervisory standards for green mortgages to properly reflect their risk (which is typically reduced compared with standard mortgages).
- **Facilitate orderly and efficient debt resolution:** foreclosure procedures should strike a balance between the rights of borrowers and lenders so that both sides have an interest in managing housing loans risks.

Source: Van Hoenselaar et al. (2021).

The uneven recovery of global RMBS and CMBS markets following the GFC

US real estate MBS markets have recovered well from the GFC while issuance has remained subdued in other major markets (Figure 1). At end-2020, US RMBS issuance exceeded pre-crisis levels and CMBS issuance stood at levels reached before the GFC. A notable development is also the dominance of MBS issuance by US government sponsored enterprises (GSEs) that account for 90% and 85% of global RMBS and CMBS issuance respectively at end-2020 while before the GFC non-agency MBS issuance accounted for less than half of total issuance. Agency CMBS and agency mortgage-backed securities' purchasing programs implemented by the Federal Reserve since March 2020 supported record high US agency RMBS and CMBS issuance in 2020. Also, the strengthening of the US GSEs regulatory framework and oversight following the GFC has helped improve credit standards, with agency MBS being safer than they were a decade ago (S&P Global Ratings, 2020a). For instance, non-agency RMBS are no longer backed by the type of subprime and Alt-A collateral that was widespread prior to the GFC. Also, mortgages securitised by US agencies now need to conform to specific guidelines that relate to credit quality and loan size. Issuers of RMBS for which the collateral does not meet the qualified mortgage (QM) guidelines generally need to retain at least a 5% share of equity. In addition, CMBS markets have undergone a major shift from the private label market to the agency space since the GFC. Also, the market share of balance sheet lenders in CMBS markets has declined over the past decade. Pre-crisis, conduits (i.e. multi-borrower deals) dominated the market before the GFC, accounting for over 90% of issuance. However in recent vintages, single-borrower deals (which have a better performance history than conduits) make up about 40%-50% of issuance. Credit enhancement levels are substantially higher now relative to pre-crisis levels, with underwriting standards also improving. Importantly, CMBS issuers need to either retain equity themselves or assign it to a third party. Some financial innovations continue to flourish in CMBS markets as reflected by the rising market share of commercial real estate collateralised loan obligations (CRE CLOs) in recent years (Annex B). Such developments recall the innovation-fragility view that has identified financial innovations as the root cause of the GFC, characterised by the engineering of securities perceived to be safe but exposed to neglected risks, and demonstrate the need to monitor associated risks and the implementation of adequate regulation (Brunnermeier, 2009).

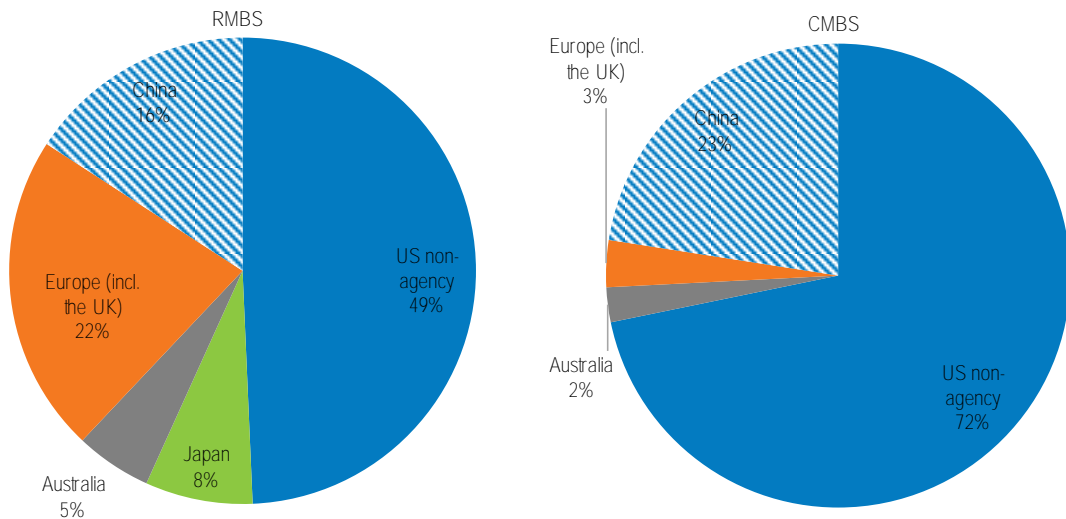
Figure 1. Notional amount of real estate MBS issuance in selected major real estate finance markets, 2005-2020



Note: US agency issuance includes both agency and residential and multifamily securitisations from Fannie Mae, Freddie Mac, or Ginnie Mae excluding risk transfer deals. All other government agency or GSE securitisations or guarantees and GSE risk transfer deals are part of non-agency ABS or MBS. Other selected RMBS markets include Australia, China, European Union (including the United Kingdom) and Japan. Source: SIFMA, AFME, JSDA, Australian Securitisation Forum, CNABS, OECD calculations.

Excluding US agency MBS markets, while US non-agency MBS markets dominate, Europe and China are the two other largest RMBS and CMBS markets. While the size of Chinese real estate MBS markets remain small in nominal terms, both RMBS and CMBS issuance have recorded the highest growth rates over recent years compared to other major markets (Figure 2).

Figure 2. Distribution of MBS issuance in selected major real estate finance markets excluding the US-agency market, 2020

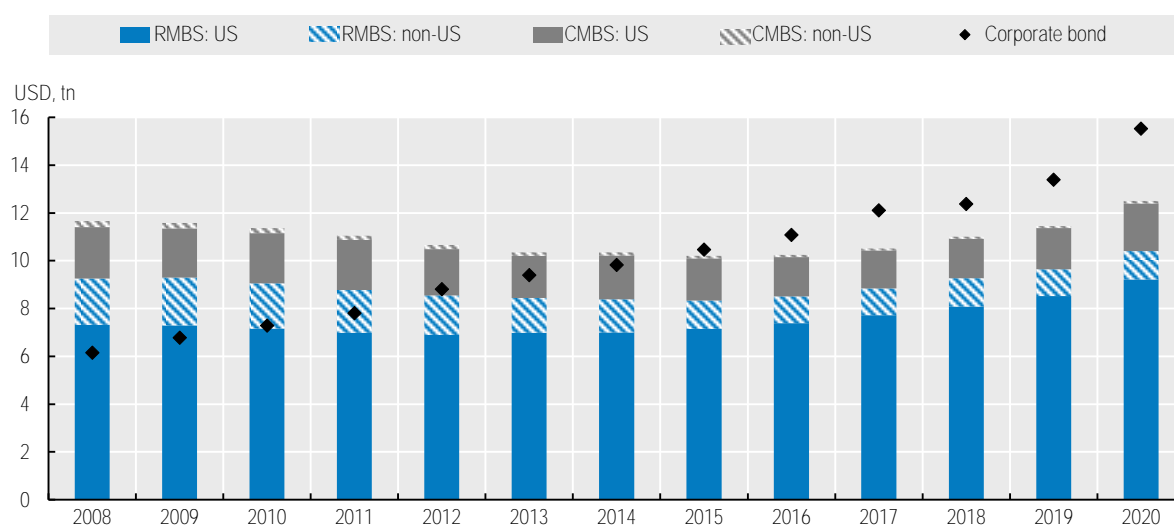


Source: SIFMA, AFME, JSDA, Australian Securitisation Forum, CNABS, OECD calculations.

The global RMBS market exceeds the pre-GFC peak, while outstanding corporate bonds have nearly tripled

Outstanding MBS globally totalled USD 13 trillion in 2020, with the outstanding US RMBS market remaining the largest totalling USD 9 trillion (Figure 3). In comparison, in 2008, global real estate MBS markets were twice as large as corporate bond markets today in major real estate finance markets. However in 2020, the relative size of global real estate MBS markets represented 80% of total outstanding corporate bonds. While global real estate MBS markets have expanded substantially over the last decade, other market-based finance markets have experienced even stronger growth.

Figure 3. Outstanding amount of MBS and corporate bond in selected jurisdictions, 2012-2020



Note: Aggregate corporate bond outstanding amount is calculated including United States, European Union (including the United Kingdom), Japan, Australia and China.

Source: SIFMA, AFME, JSDA, Australian Securitisation Forum, CNABS, BIS Debt securities statistics database, OECD calculations.

Hedging activities on MBS markets may have substantial spillover effects on US Treasury markets that are mitigated by Federal Reserve's MBS holdings

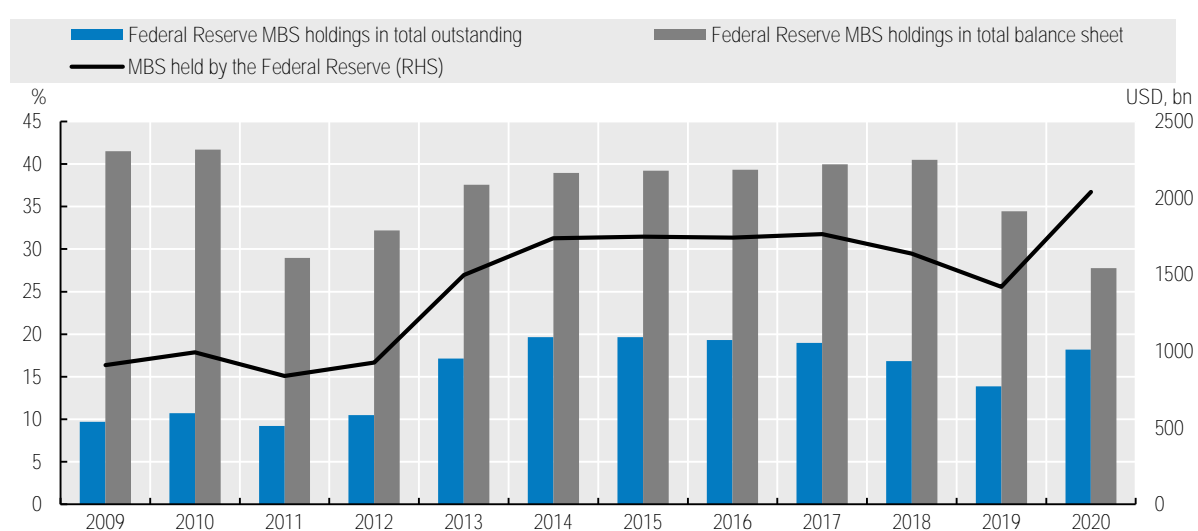
As MBS are fixed-income products, they are sensitive to changes in interest rates.¹ When interest rates increase, the price of an MBS tends to fall at an increasing rate and much faster than a comparable Treasury security due to duration extension, a feature known as negative convexity.² Managing the interest rate risk exposure of MBS relative to Treasury securities requires dynamic hedging to maintain the desired exposure of the position to movements in yields, as the duration of the MBS changes with fluctuations in

¹ The interest rate risk of MBS differs from the interest rate risk of Treasury securities because of the embedded prepayment option in conventional residential mortgages that allows mortgage refinancing. When interest rates fall, mortgage refinancing tends to increase to take advantage of lower rates, thereby increasing prepayments and depriving MBS investors of the higher coupon income. However, when interest rates rise, refinancing activity tends to decline sharply and prepayments fall. This is commonly known as "extension risk" in MBS markets.

² This refers to the fact that when interest rates rise, MBS price is falling like the price of long-term bonds. However, when rates fall, MBS prices rise slowly or not at all.

the yield curve.³ Duration hedging of MBS can be performed with interest rate swaps or Treasury bonds and notes. MBS holders will find the duration of their MBS extending when interest rates increase, which they may choose to offset by selling Treasury notes or bonds, or by paying a fixed interest rate in swaps. A rise in medium- to long-term interest rates can therefore trigger a self-reinforcing sell-off in Treasury securities⁴ and related fixed income markets, fuelled by MBS hedging. Such a phenomenon is known as a convexity event. Concerns have increased following an increase in interest rates in certain jurisdictions, in a context of higher inflation and subsequent tapering in asset purchases of major central banks that could eventually trigger a substantial repricing of Treasury securities and increase the likelihood of bouts of volatility in Treasury markets when the rate transition would occur. Nevertheless, Federal Reserve's holdings of MBS may contribute to mitigate the impact of hedging activities on the volatility of MBS and Treasury markets. In particular, the Federal Reserve, which held about 20% of total outstanding US MBS in 2020 (Figure 4), does not hedge pre-payment risk because it does not target the duration of its portfolio, unlike many institutional investors.

Figure 4. Outstanding amount of US MBS and Federal Reserve holdings of MBS, 2009-2020



Note: MBS Federal Reserve holdings and total outstanding refer to agency and non-agency MBS.

Source: Federal Reserve, SIFMA, OECD calculations.

Exuberance detected in housing markets and vulnerable commercial real estate markets to conditions in the corporate sector leave the real estate finance sector fragile in the post COVID-19 environment

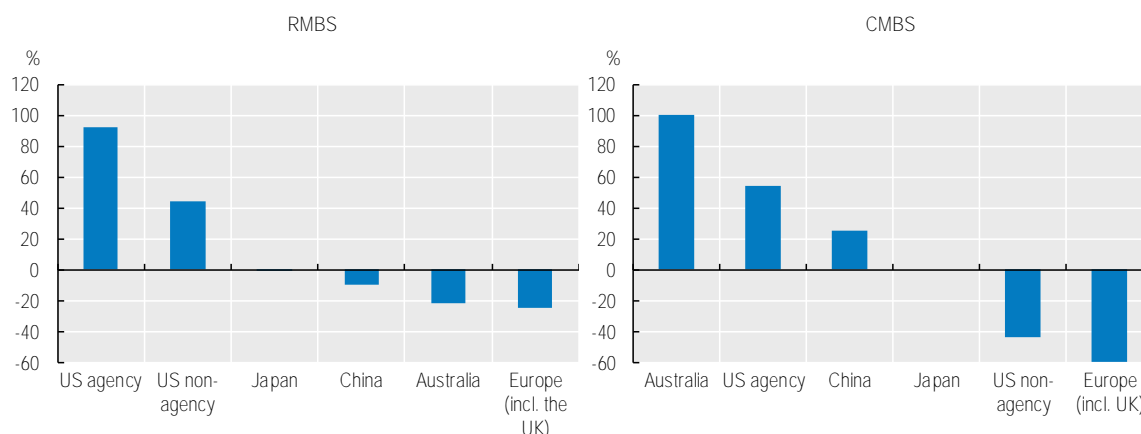
The COVID-19 crisis has resulted in a substantial decline of RMBS issuance in most non-US major MBS markets as well as of non-agency US and European CMBS issuance. In fact, RMBS issuance has declined substantially in 2020 compared to 2019 levels mainly in Europe, Australia and to a lesser extent in China. Also, US non-agency and European CMBS issuance have sharply declined (i.e. by 43% and 59% respectively). In contrast, the issuance of US non-agency RMBS have doubled and non-agency issuance

³ This practice is known as duration hedging. The amount and required frequency of hedging depends on the degree of convexity of the MBS, rates' volatility, and investors' objectives and risk tolerance.

⁴ If sufficiently strong, this hedging activity can itself cause interest rates to rise further, and further increase duration for MBS holders, inducing another round of selling of Treasuries.

have increased by almost 50% (Figure 5). In addition, the issuance of CMBS have doubled in Australia and increased by one fourth in China.

Figure 5. Change in real estate MBS issuance following the COVID-19 crisis in major markets, 2019-2020

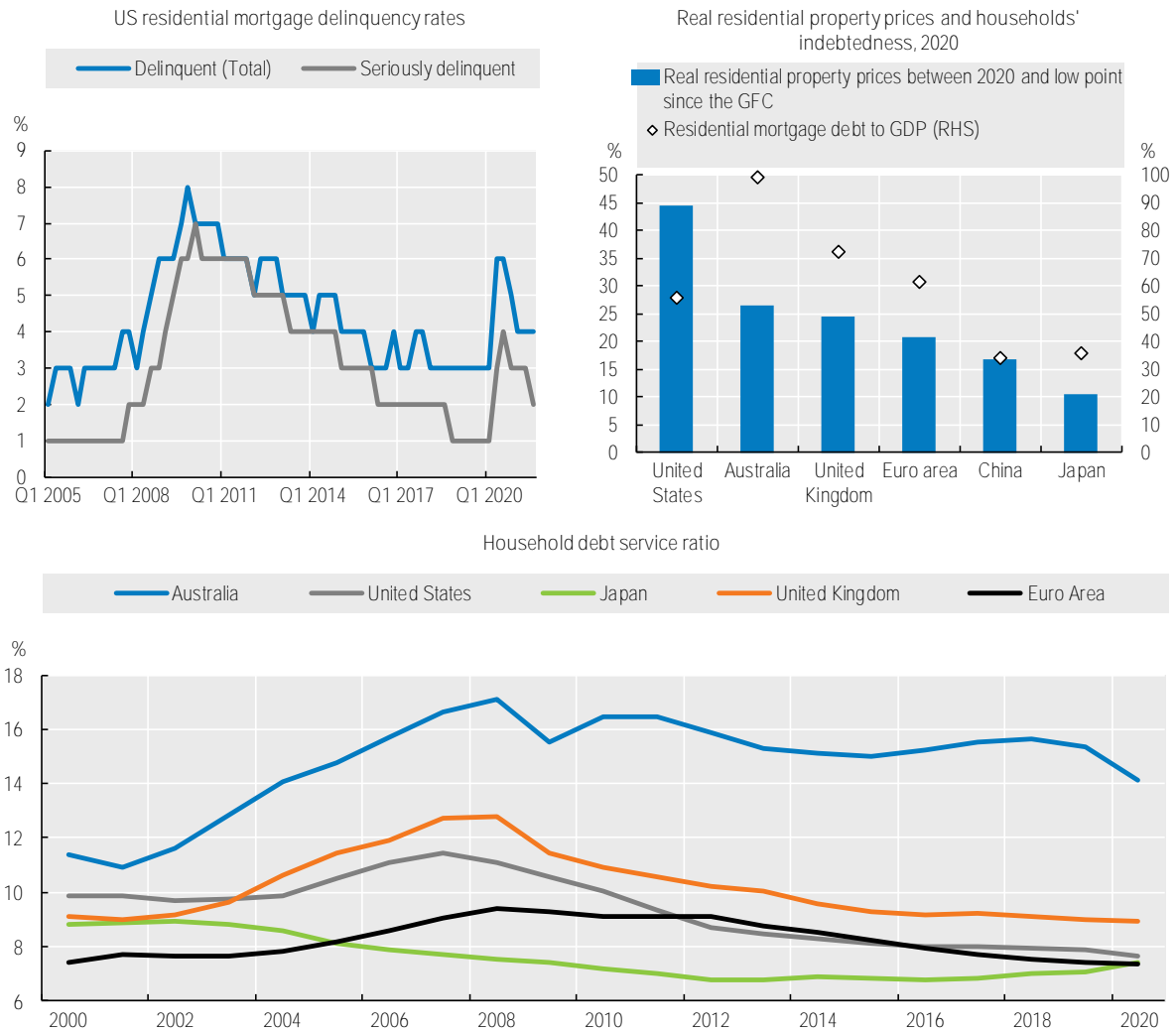


Note: These figures show the annual percent change in issuance of RMBS and CMBS in 2020 versus 2019 in selected major markets. US agency issuance includes both residential and multifamily securitisations from Fannie Mae, Freddie Mac, or Ginnie Mae excluding risk transfer deals. All other government agency or GSE securitisations or guarantees and GSE risk transfer deals are part of non-agency ABS or MBS. Source: SIFMA, AFME, JSDA, Australian Securitisation Forum, CNABS, OECD calculations.

While issuance help channel affordable intermediation to the real economy, they may contribute to growing vulnerabilities in certain jurisdictions following withdrawals of unprecedented monetary and fiscal support measures. Despite the severity of the COVID-19 crisis, residential mortgage delinquencies have generally increased moderately in 2020 (Figure 6) in major real estate finance markets (European Data Warehouse, 2021; S&P Global Ratings, 2020e; and MSCI, 2021). Importantly, guarantees and moratoria, which have been implemented in many jurisdictions appear to have avoided defaults on certain amounts of performing and non-performing loan exposures (OECD, 2021a). Also, agency mortgage-backed securities' purchasing programs implemented by the Federal Reserve since March 2020 have supported conditions in US MBS markets.⁵ Nevertheless, monetary and fiscal stimulus could fade following improving economic conditions and rising inflation in the post-COVID environment, which is likely to trigger additional defaults, with negative implications for MBS markets and spillover effects to other markets and intermediaries.

⁵ In March 2020, the Federal Open Market Committee (FOMC) directed the Desk to increase System Open Market Account (SOMA) holdings of agency MBS by USD 40 billion per month. This MBS purchasing program has been initiated following the GFC. From early 2009 through October 2014, the Federal Reserve added on net approximately USD 1.8 trillion of longer-term agency MBS and agency debt securities to the SOMA portfolio through its large-scale asset purchase programs. From October 2014 through March 2020, the Federal Reserve reinvested agency debt maturities and agency MBS principal payments of the SOMA into agency MBS, with the size of monthly reinvestments subject to a cap starting in September 2017. For further details, please see Federal Reserve Bank of New-York (2021a).

Figure 6. Residential mortgage delinquency rates, property prices and household debt, 2005-2020



Note: In the bottom chart, debt-service ratio (DSR) is defined as the ratio of interest payments plus amortisations to income. As such, the DSR provides a flow-to-flow comparison, i.e. the flow of debt service payments divided by the flow of income. Aggregate Euro Area DRS has been calculated using individual country data. There is no DSR data available in the BIS database for China.

Source: Mortgage Bankers Association of America, Eurostat, Federal Reserve, ONS, Bank of Japan, Australia Bureau of Statistics, The Peoples' Bank of China, BIS Credit and Property Prices databases, Refinitiv, OECD calculations.

The rebound of residential property prices in major real estate finance markets has also contributed to temper losses in the event of borrowers' default. Also, households' debt-service ratios (DSRs) have decreased since the GFC throughout a period of low interest rates, which has in part contributed to improved households' mortgage affordability and decreased payment risk.⁶ Nevertheless, residential

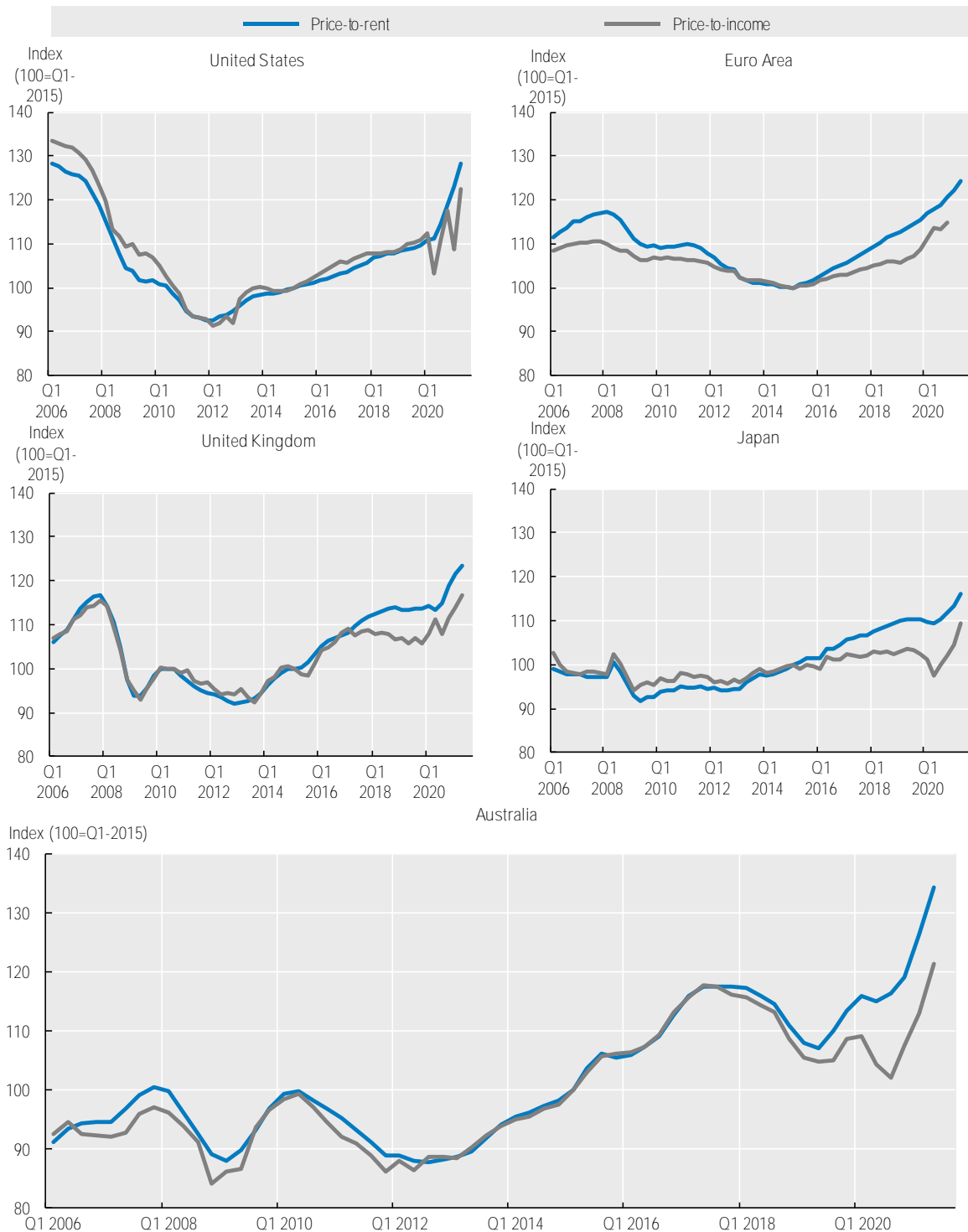
⁶ In China, DSR has risen over the last decade and has reached higher levels than in some advanced economies in 2018. Also, mortgage debt has been the biggest driver of the increase in household debt over the past decade, and now accounts for around half of household debt in China. Nevertheless, high household saving rate in China has resulted in a large accumulation of both property and financial assets that tend to mitigate household leverage. Besides, most debt is owed by high-income households, who are better placed to support high DSR ratios since a smaller share of their income is needed for essential items like food. For further details, please see Reserve Bank of Australia (2019) and Chan. S. (2020).

property prices and the level of households' indebtedness remain elevated in certain jurisdictions. As of 2020, residential house prices had risen by almost 45% in the United States since the 2011 low point. Residential house prices also rose substantially in Australia, the United Kingdom, and the Euro Area, that all collectively exhibit the highest residential mortgage debt to GDP ratios compared to other major markets. In addition, house prices are growing faster than incomes suggesting that housing is becoming less affordable in major real estate finance markets (Figure 7). Furthermore, price-to-rent ratios have continuously risen since 2012 in major real estate finance markets with a notable acceleration observed since 2019 in Australia and since 2020 in other major real estate finance markets. These trends suggest that the cost of properties are increasing faster than rents in these jurisdictions, which is in turn eroding the return on investment for property owners. Also, values of price-to-rent and price-to-income ratios at the end of the first quarter of 2021 are at least equal or exceed the levels reached before the GFC in major real estate finance markets. Therefore, housing affordability and valuation concerns are of a similar magnitude to those that prevailed on the eve of the GFC. Therefore, should interest rates start to rise, as the economic recovery gains momentum combined with a correction in housing prices, increasing household mortgage payment risk and deterioration in the value of residential mortgage collateral could lead to rising downgrades of RMBS and rising losses for a wide range of intermediaries exposed to these markets.

Delinquency rates in US industries that have been the most sensitive to the economic consequences of the COVID-19 pandemic (such as travel, hotels, and retail sectors) remain elevated despite declining from the peaks reached in 2020, as a result of the gradual deployment of effective vaccines and implementation of additional fiscal support in some countries (Figure 8). According to AFME (2021), downgrades outpaced upgrades particularly for US CMBS in 2020 and to a lesser extent in Europe. While conditions have improved in both US and European CMBS markets as reflected by substantial tightening of CMBS option adjusted spreads during the second quarter of 2020, conditions remained strained in European CMBS markets with spreads remaining above the levels observed before the COVID-19 outbreak. Agency CMBS purchasing programs implemented by the Federal Reserve since March 2020 have helped to support conditions in both agency and non-agency US CMBS markets.⁷ In particular, US CMBS option-adjusted spreads have declined and returned to their pre-pandemic levels in mid-2021 (Figure 17). Given the high procyclicality of the commercial real estate sector, its outlook is closely tied to the broader economic recovery but also to possible pandemic-induced structural changes, which could be characterised by increasing remote working and e-commerce, that may result in a permanent decline in demand for space with potential severe impacts on property value (Fitch Ratings, 2021a). Looking ahead, CMBS may experience further rating downgrades, which could have negative implications for a wide range of intermediaries exposed to such products. Other international organisations are raising similar concerns about developments and risks in the commercial real estate sector (IMF, 2021a). and the need to maintain policy measures aimed at supporting the flow of credit to viable corporates to stimulate aggregate demand and facilitate a recovery of the sector and strengthen financial resilience.

⁷ Effective March 23, 2020, the FOMC directed the Open Market Trading Desk (the Desk) at the Federal Reserve Bank of New York to purchase agency commercial MBS (CMBS) on behalf of the SOMA. The Desk purchased in the open market agency CMBS secured primarily by multifamily home mortgages that are guaranteed fully as to principal and interest by Fannie Mae, Freddie Mac, and Ginnie Mae and that the Desk has determined are suitable for purchase. In light of the sustained smooth functioning of markets for these securities, the Desk no longer conducts regular operations to purchase agency CMBS since March 23, 2021. For further details, please see Federal Reserve Bank of New-York (2021b).

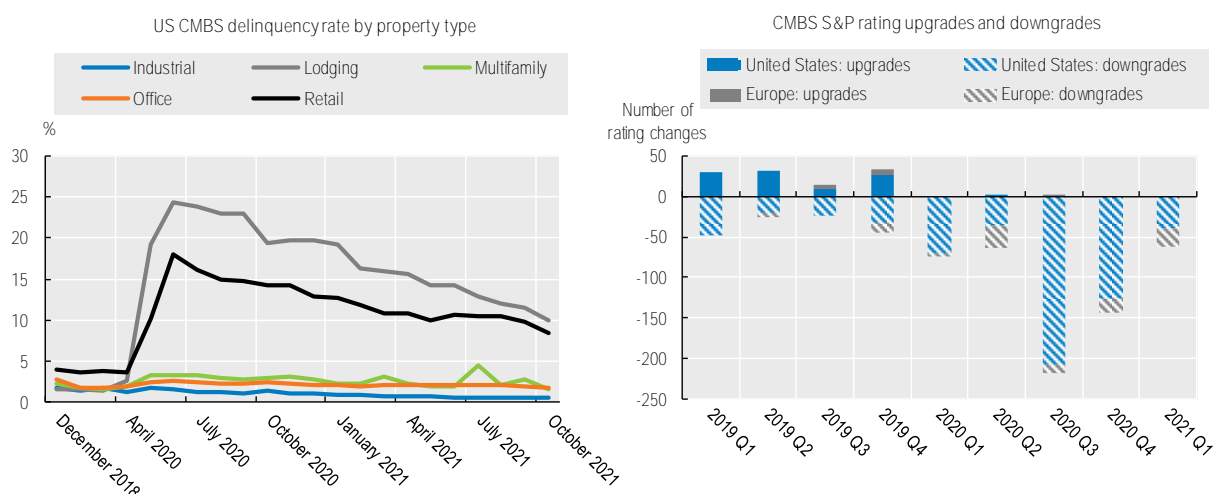
Figure 7. House price-to-rent and price-to-income ratios in major real estate finance markets, 2006-2021



Note: The price-to-income ratio is the nominal house price index divided by the nominal disposable income per head and can be considered as a measure of affordability. The price-to-rent ratio is the nominal house price index divided by the housing rent price index and can be considered as a measure of the profitability of house ownership.

Source: OECD Analytical House Prices Indicators database, OECD calculations.

Figure 8. CMBS delinquency rates by sector and rating movements, 2018-2020



Source: Trepp, AFME, OECD calculations.

Real estate assets and subsequently real estate finance markets are also exposed to medium-term challenges from climate physical and transition risks. Recent extreme physical climate events globally have shown how climate change is impacting the natural environment and how it could create risks for corporates, financial intermediaries and economic growth prospects. In particular, levels of physical and transition risks can vary dramatically between firms depending on their geographical location and economic sector.⁸ These developments may have major implications for CMBS markets as the credit quality of non-financial corporates is likely to deteriorate due to higher losses and operational costs. According to Moody's (2021a), firms with facilities in South East Asia, the Middle East, and the Caribbean, with high exposures to warming-related climate and weather events, will have relatively high physical risks. On the other hand, firms in industrial sectors such as coal, oil and gas, and electricity generation, which are highly exposed to carbon transition, will have relatively high transition risk. Also, the value of commercial real estate collateral is likely to depreciate due to significant damages following extreme climate events. Therefore, the depreciation of commercial real estate assets put as collateral in mortgages underlying CMBS or the deterioration in the credit quality of non-financial corporates may imply downgrades and price decline of CMBS that would trigger losses for a wide range of financial intermediaries and investors exposed to these markets. Given significant liquidity transformation of mREITs and REMFs, asset fire sales could amplify price movements, in turn transmitting stress to other parts of the financial system, and disrupting the availability of finance to the real economy.

The deterioration of credit quality of the largest Chinese real estate developers could have broad effects for Chinese financial institutions and the corporate bond market

Investors are increasingly concerned by the deteriorating financial soundness of Chinese real estate developers that could lead to potential losses for Chinese banks and strained financing conditions for Chinese speculative-grade corporate bond issuers. In September 2021, the price of Hong Kong-listed

⁸ Physical risk encompasses the costs and risks arising from the physical effects of climate change on businesses' operations, workforce, markets, infrastructure, raw materials, and assets. Transition risk encompasses the costs and risks associated with the transition to a lower carbon economy and can include policy changes, such as carbon taxes or cap and trade, new regulations on goods and services, reputational impacts, and shifts in market preferences, norms, and technologies.

shares of Evergrande has declined from 44% since historical highs reached in at end-2018 (Figure 9). The drop underscores concerns about the broader health of China's real estate sector with spillovers notable to the equity and corporate bond markets. Such spillover effects illustrate how the deterioration of the financial soundness of large companies in the real estate sector may affect other parts of the financial sector and threaten resilience. Notably in September 2021, Fitch Ratings downgraded the largest Chinese and highly leveraged real estate developer Evergrande Group to 'CC' from 'CCC+' (Fitch Ratings, 2021c). The downgrade reflects Evergrande's diminishing margin of safety in preserving liquidity. Evergrande's liquidity is fragile as the firm heavily relies on bond financing, short-term banking facilities and trust loans, continued access to trade payables, and robust contracted sales to generate cash flow (Financial Times, 2021b; Fitch Ratings, 2021b; and Reuters, 2021). According to Fitch Ratings, Evergrande's liabilities amounted to about USD 300 billion at-end 2020, much of which was held by banks and other financial institutions.

Evergrande is not the only Chinese developer experiencing challenges. In March 2021, Ping An-backed China Fortune Land Development failed to repay a USD 530 million bond as the company recorded a USD 3.2 billion loss following the default of China Fortune Land Development (i.e. a developer that specialises in industrial parks in the northern Hebei province; Financial Times, 2021a). Also, Fitch Ratings downgraded the company's debt rating to CC from CCC in February 2021. These developments follow a spate of corporate defaults during the second semester 2020 that sent shockwaves through the country's USD 15 trillion onshore bond market. In addition, Chinese developers are increasingly targeted by short sellers (Financial Times, 2021c). For example, bonds issued by Yuzhou Group Holdings and Shimao Group Holdings, that were loaned out, are up from less than USD 200 million in June 2021 to USD 280 million and over USD 400 million respectively in August 2021.

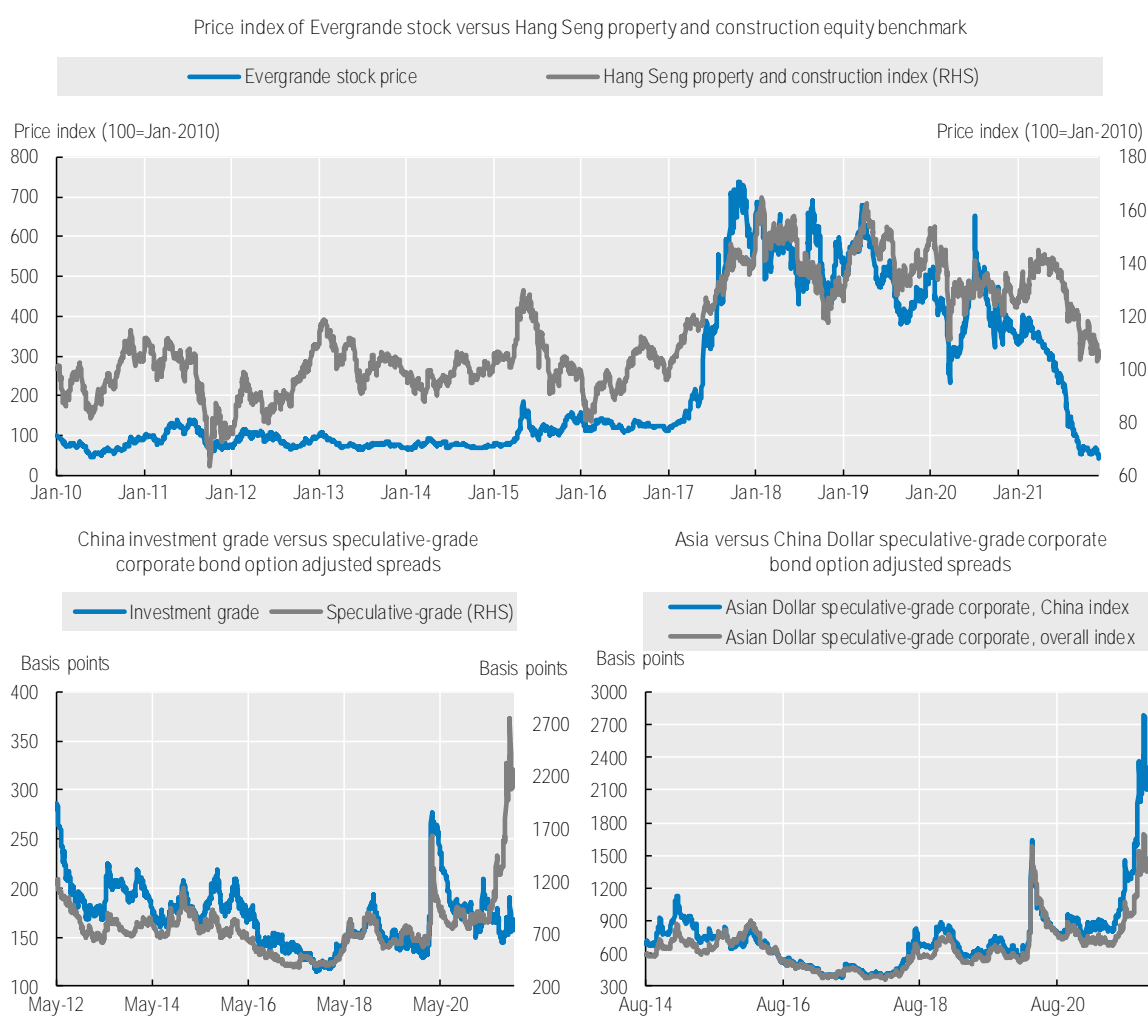
Some market participants suggest that Evergrande Group is unlikely to become China's version of the 2008 Lehman Brothers crash and strained conditions in the Chinese real estate development sector is unlikely to trigger a new Subprime crisis, for several reasons (Bloomberg, 2021c and 2021d). First, Chinese authorities also have tools that could help address financial stability risks. Nevertheless, financial distress of several large Chinese real estate developers has contributed to the deterioration of credit market conditions of other property developers and leveraged corporates. For instance, spillovers through Chinese speculative-rated corporate bond markets have resulted in weakened funding access to developers, and intensified credit polarisation amid rising investors' concerns about the impact of tight regulatory conditions on funding and large real estate developers' distress (Moody's, 2021b). In contrast, only some financial institutions, such as small regional banks and trust companies, are expected to suffer losses from exposure to Chinese real estate developers. The direct exposure of China's big four state-owned asset management companies, large banks and rated Chinese insurers is not significant.⁹ Also, the impact on China's RMBS is expected to be limited given stringent mortgage policies and the highly diversified securitised pools of most Chinese residential mortgage transactions. While direct exposures to Chinese assets in the international financial system have risen over the last decade following the gradual liberalisation of capital flows,¹⁰ the size of these links remain modest, at around 2% of international portfolios and 4% of international banks' cross-border loans (Figure 10). Therefore, strained conditions for Chinese real estate developers and possible defaults are likely to spill over, mainly to Asian international bond markets. International banks and foreign investors with exposures to these loans or markets are likely to record losses following rating downgrades or defaults of some Chinese real estate developers. Given this relatively modest direct exposure, however, spillovers from strained conditions in the Chinese real estate development sector are unlikely to affect a substantial share of cross-border positions of international banks and foreign investors.

⁹ According to S&P (2021c), real estate and construction loans of the top 15 Chinese banks represent 11% and 4% of total corporate loan exposures, respectively at end-2020.

¹⁰ In nominal terms, investment portfolio flows to China and cross border loans from international banks to Chinese residents have almost quadrupled and doubled over the last decade.

In the longer-term, financial distress of Chinese real estate developers is likely to trim economic growth in China as the real estate sector may not recover as strongly as in previous cycles (Moody's, 2021c). The prolonged slowdown in the property market would be more concerning for many regional and local governments that could face substantial declines in revenues following drops in land sales. Tightening budget conditions for regional and local governments would curb infrastructure financing and undermine growth. Nonetheless, given the size of China's economy and financial system as well as its extensive trade linkages with the rest of the world, weakening Chinese demand for goods in advanced markets could negatively affect investor risk sentiment in global financial markets, and have a direct impact on global equity valuations, especially if global economic growth starts to stall (Federal Reserve, 2021b).

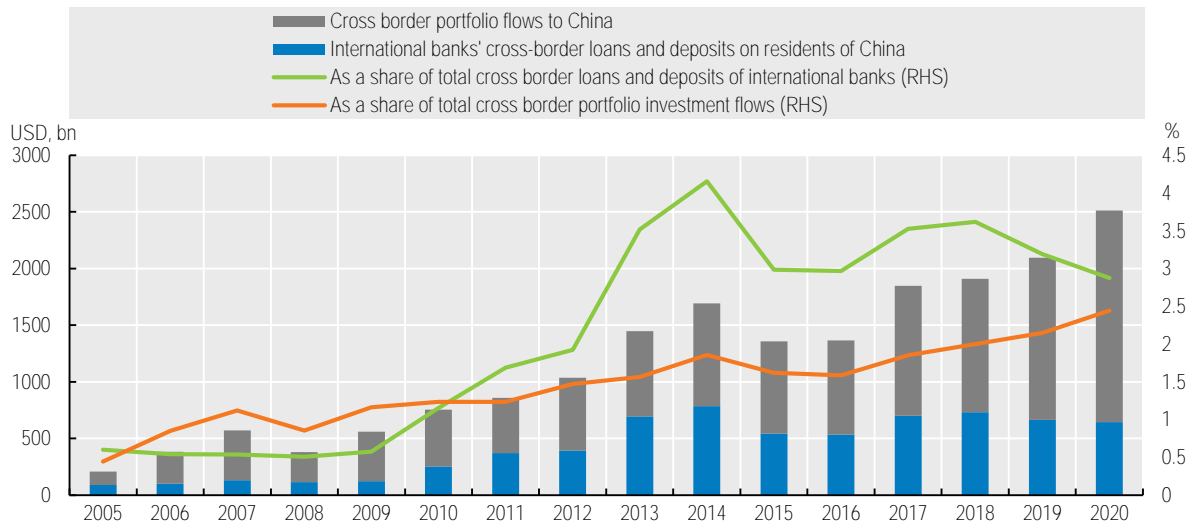
Figure 9. China real estate versus overall corporate China or Asian equity and bond indices, 2010-2021



Note: The bottom left figure shows option adjusted spreads of ICE BofA investment grade versus high-yield emerging markets corporate plus (including China issuers only) indices. The bottom right figure shows option adjusted spreads of ICE BofA Asia versus China Dollar high-yield corporate indices. These benchmarks are including both financial and non-financial corporates.

Source: Refinitiv, OECD calculations.

Figure 10. China's direct links to the global financial system



Note: This chart shows cross border loans of international banks to Chinese residents and portfolio investment flows to China. Data are expressed in USD billion and as a share of total cross border exposures or total cross border portfolio flows.

Source: BIS International Banking database, IMF Coordinated Direct Investment Survey database, OECD calculations.

In August 2020, Chinese regulators¹¹ launched an evaluation procedure and required twelve pilot developers to submit detailed reports of their financing situation (UBS, 2021). The aim was to limit real estate developers' borrowing as Chinese authorities became increasingly concerned over the level of indebtedness in the sector and of implications for the real economy. Chinese regulators are assessing the financial soundness of developers' finance against three criteria, named the "three red lines": i) a liability to asset ratio (excluding advance receipts) of less than 70%; ii) a net gearing ratio of less than 100%; and iii) a cash to short-term debt ratio higher than 1. If the developers fail to meet any of the three red lines, regulators would then place limits on the extent to which they can increase their debt. According to S&P estimates, only 6.3% of their rated developers fully comply with all of the three red lines in 2020 (S&P Global Ratings, 2020e). Therefore, developers will have to improve their credit standards to meet regulatory thresholds and will be under pressure in the couple of years to come. Such improvements will help improve the credit quality of collateral and could mitigate risks in Chinese credit markets, such as in corporate bond and CMBS markets, in the longer term.

2.2. Covered bonds

Covered bond markets have also recovered from the GFC dominated by mortgage and European bonds

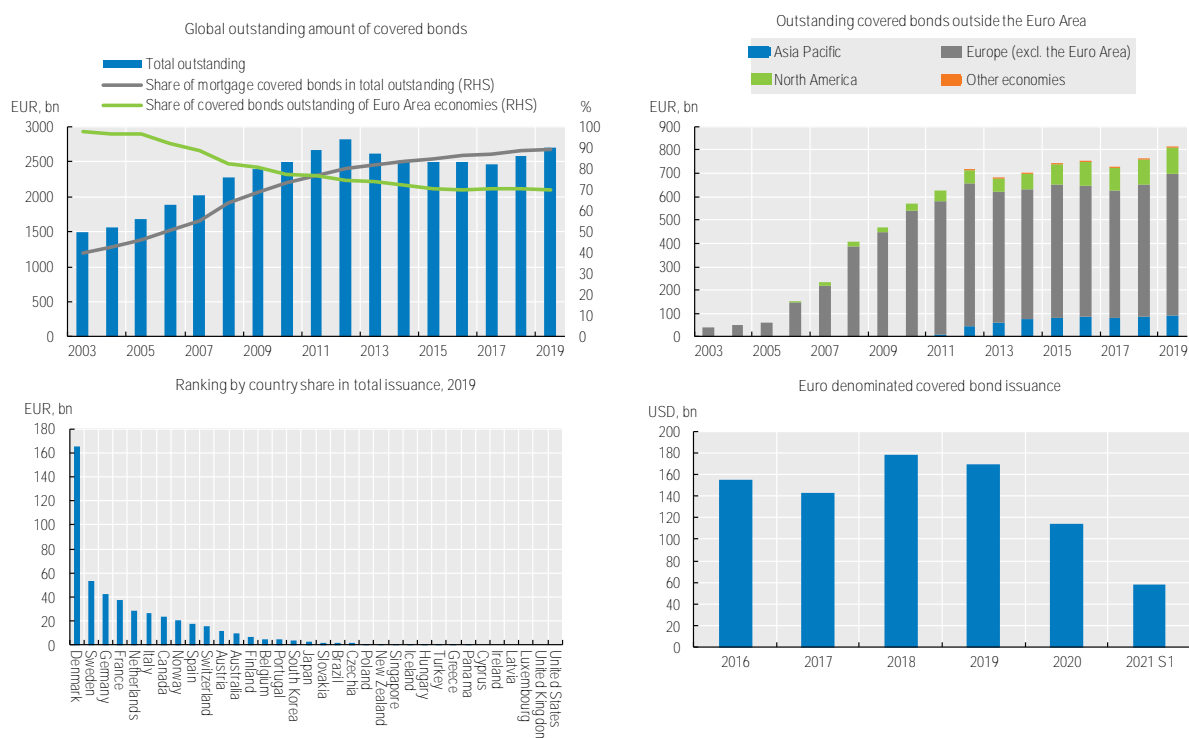
Covered bonds are debt instruments issued by a bank or a mortgage institution that are backed by collateral, a so called cover pool, which is composed of private sector loans (usually residential and/or commercial mortgage loans) or public sector debt instruments (usually loans and/or debt securities). The global covered bond market has substantially expanded over the last decade. Notably, the outstanding amount of covered bonds peaked at EUR 2.8 trillion in 2012 and stood at EUR 2.7 trillion in 2019 (Figure 11). Covered bonds backed by mortgages account for the largest share of outstanding covered bonds, representing 90% of the total outstanding amount in 2019. Initially dominated by European issuers,

¹¹ Chinese regulators include the People's Bank of China and the Ministry of Housing and Urban-Rural Development.

covered bond markets have expanded globally over the last decade, including in the Asia Pacific, North America and in several emerging economies. Nevertheless, top issuers in 2019 remained European banks.

The very low interest rate environment following the GFC and the European Central Bank (ECB)'s Covered Bond Purchase Program (CBPP3), have created favourable conditions to establish covered bond programs in new countries.¹² Since 2014, spreads between covered bonds and sovereign bonds have been driven to a large extent by the quantitative easing programmes and more broadly by very low interest rates in the Eurosystem. When the first round of quantitative easing started in October 2014, the ECB only included covered bonds and asset-backed securities (ABS) in the scope of eligible purchases. This led to a substantial tightening of spreads between covered bonds and public sector debt up until mid-January. However, when the Eurosystem finally announced the expansion of quantitative easing to public sector debt, the differences widened again (ECBC, 2019).

Figure 11. Covered bond issuance and outstanding globally, 2003-2018



Source: ECBC, SIFMA, Dealogic, OECD calculations.

¹² European institutions are improving covered bond market regulation and principles. A key development is the finalisation of the harmonised covered bond legislative framework proposed by the European Commission, the European Parliament, and the Council of the European Union, which Parliament approved by vote on April 18th 2019. This legislative package provides a common definition of covered bonds, defines the product's structural features, and clarifies the responsibilities for supervising the product. It also amends the Capital Requirements Regulation with the aim of strengthening the conditions for granting preferential capital treatment. Such harmonised framework contribute to strengthen the resilience of the European covered bond market by raising the standards for asset quality, disclosure and supervision. For further details, see The European Parliament and the Council of the European Union (2019).

Covered bonds are a secured and low-cost source of funding for banks

Covered bonds are a secured type of funding but with strong guarantees on collateral compared with other types of non-government guaranteed collateralised debt. Since the assets are kept on the issuer's balance sheet, they are subject to standard prudential regulation, including capital requirements. In addition, dynamic replenishment and dual recourse imply that all assets of the bank will back covered bonds in the event of losses on the pool of encumbered assets.¹³ Both features provide strong incentives for banks to control risks in their asset portfolios. This encourages robust underwriting practices, thereby minimising regulatory arbitrage and avoiding some of the pitfalls with the originate-to-distribute model common in securitisation and MBS products (Acharya et al., 2013; and ECB, 2020a). Given such guarantees, investors accept lower interest rates for covered bonds than for unsecured debt, making them a source of low-cost funding for banks. Moreover, if banks are matching the duration of covered bonds to the terms of their mortgages, it may directly add stability to the composition of bank funding. Thus, banks may use covered bonds to diversify and stabilise their funding sources.

Covered bond funding requires banks to maintain a cover pool of high quality assets and may increase refinancing risk from unsecured wholesale funding

From an issuer perspective, senior unsecured funding is probably the most flexible form as it does not restrict the composition of asset. By contrast, covered bonds require the issuer to maintain a cover pool of high quality assets backing the bonds. Covered bonds limit the issuer's flexibility regarding the underlying cover assets and cause higher administrative costs (e.g. hedging, additional ratings, cover pool administrator) compared to senior unsecured bonds. In addition, regulatory rules and rating agencies often require that the mismatch between the covered assets and outstanding covered bonds is limited and that the covered bond issuer holds a certain amount of over-collateralisation (Bank of Canada, 2018). Since the asset pool backing covered bonds is replenished, losses that surpass the bank's capital are concentrated on unsecured debt holders. Therefore, the more covered bonds a bank issues, the higher the riskiness of its unsecured obligors. This has an indirect effect on bank funding by increasing the cost of unsecured funding. It can also subject the bank to higher rollover risk, since a meaningful proportion of unsecured debt is short-term. Greater covered bond funding may thereby exacerbate bank liquidity risk and raises the probability that a negative shock to asset values could threaten the bank's resilience. From a system-wide perspective, the increase in bank fragility can have financial stability implications.

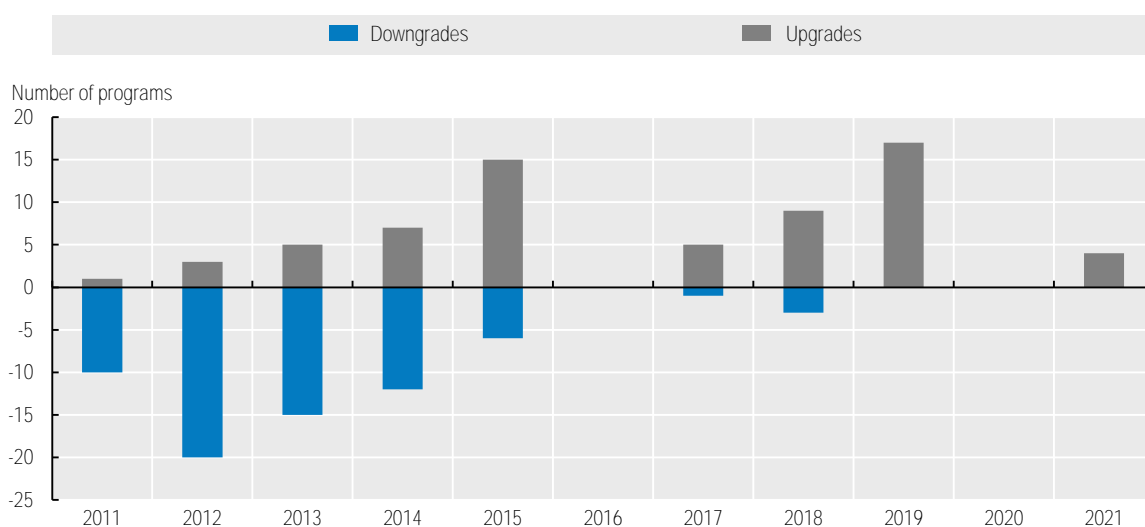
Global covered bond issuance have declined following the COVID-19 crisis but credit quality of covered bonds has remained unaffected despite waning support

Covered bond issuance declined in 2020 compared to 2018 and 2019 and remained moderate during the first two quarters of 2021. The main causes of this slowdown are issuers renewed access to competitively priced central bank funding, and growth in bank deposits due to reduced consumer spending (S&P Global Ratings, 2021b). Nevertheless, according to analysis performed by S&P Global Ratings, credit conditions on covered bond markets are expected to remain stable and covered bonds may remain attractive in raising funding at longer maturities than those offered by central bank schemes following ECB monetary policy tightening in 2021-2022 (S&P Global Ratings, 2021c). Also, interest in issuing sustainable covered bonds could increase as the European Union recently approved and amended several related regulations. Importantly, payment moratoria have already expired in several European economies and there is no evidence of any cliff effects in the labour market from the phasing out of short-time work schemes.

¹³ A covered bond provides a double-layered protection of covered bond cash flows for an investor, as the payments are disrupted only when the issuer defaults and the cover pool resources are insufficient to make payments in a timely manner.

Therefore, a limited credit impact on prime residential mortgage loans once fiscal and regulatory support wanes may be expected. However, the impact on the performance of commercial real estate assets may be more severe but cover pools' exposures are limited. Despite S&P Ratings has revised the ratings and outlooks of several European banks issuing covered bonds since March 2020, these rating actions had no impact on the ratings or outlooks of the covered bonds issued by these entities due to the unused notches of uplift as buffer to the covered bonds ratings (Figure 12). Also, the availability of more credit enhancement than is required to reach the maximum collateral-based uplift under S&P Ratings covered bond criteria reduces the risk that covered bonds could be downgraded due to deteriorating cover pool quality. Nevertheless, credit enhancement may imply some downside risks for the issuer banks if they are enhancing the buffer. In fact, following credit deterioration, the issuer banks may have to take on more risk for the same level of funding.

Figure 12. Covered bond rating actions, 2011-2021



Source: S&P Global Ratings.

2.3. Mortgage real estate investment trusts

REITs have experienced considerable growth since the GFC as they have provided attractive returns for investors hunting to boost their portfolio return

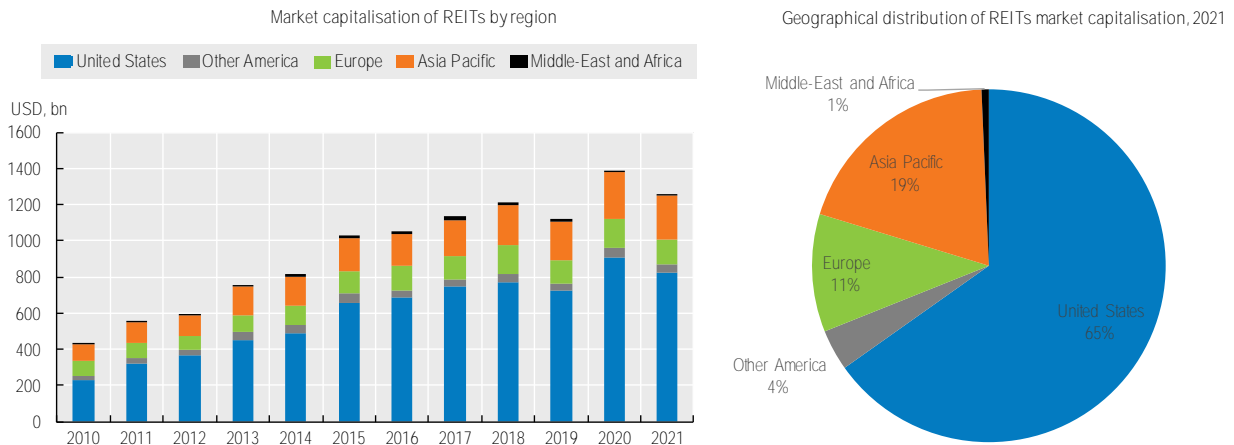
During this prolonged low interest rate environment since the GFC, REITs have become attractive investment opportunities for investors as REITs benefit from favourable legal treatment, offering relatively higher dividend payout ratios compared to equities, and/or provide diversified and liquid real estate investments.

REITs are specialised investment vehicles that by law must hold and derive most of their income from real estate-related assets. Notably, REITs generate tangible income in the form of dividends. Also, US REITs are exempt from federal corporate income tax if they distribute to their investors at least 90% of their taxable net income annually. REITs generally specialise in either owning physical real estate assets or providing debt financing to real estate investors or developers. REITs are share-like securities¹⁴ that give

¹⁴ REITs listed on major stock exchanges provide more liquid investments than private REITs, i.e. the delay for an investor of selling shares on a stock exchange being shorter than finding a counterparty on a "private equity market".

investors access to more liquid real estate investments than holding physical real estate assets. Figure 13 shows that the equity market capitalisation of the REIT industry globally has almost tripled over the last decade, increasing from USD 430 billion in 2010 to over USD 1.3 trillion in 2021. In 2021, US REIT sector¹⁵ is the largest compared to other advanced and emerging economies, representing 65% of global REIT market capitalisation.

Figure 13. Market capitalisation of REITs globally and geographical distribution, 2010-2021



Note: Data provided by major partners of the Real Estate Equity Securitisation Alliance (REESA) are limited to publicly traded REITs industry. Members of the REESA include the Asian Pacific Real Estate Association, (APREA); the Association for Real Estate Securitisation (ARES); the British Property Federation (BPF); the European Public Real Estate Association (EPRA); the Property Council of Australia (PCA); the Real Property Association of Canada (Realpac) and Nareit. These figures show aggregate market capitalisation by region including REITs that are constituents of the FTSE Nareit REIT indices.

Source: Refinitiv, OECD calculations.

The size of the mortgage REIT sector has increased since the GFC, dominated by residential mREITs while commercial mREITs are expanding

Within the REIT industry, there are two broad types of REITs: equity REITs and mortgage REITs (mREITs) with very distinct characteristics. While equity REITs invest in physical properties, mREITs invest in mortgages¹⁶ and MBS', making them real estate debt owners. Within mREITs, these entities tend to either focus on residential mortgages and RMBS or commercial mortgages and CMBS.

According to Nareit (2018), most residential mREITs focus their investments on MBS issued by GSEs and are often called agency mREITs.¹⁷ Also, several residential mREITs invest in mortgage servicing rights (MSRs). Prior to the GFC, several mREITs focused on non-agency MBS', including those backed by subprime mortgages, as well as residential whole loans and commercial real estate debt, in addition to holding agency MBS'. Non-agency mREITs constituted over 70% of the market capitalisation of the residential mREIT sector prior to the GFC. Most recorded substantial losses due to defaults by

¹⁵ According to Nareit, the Internal Revenue Service shows that there are about 1,100 US REITs that have filed tax returns in 2020. There are more than 223 REITs in the United States registered with the SEC that trade on one of the major stock exchanges. Given that REITs must distribute at least 90% of their taxable net income annually to remain exempt from federal corporate income tax, any significant growth requires new equity issuance and an increase of the market capitalisation of REITs equity benchmarks.

¹⁶ In addition to funding mortgages, some mREITs provide other types of financial activities that support the mortgage sector, including servicing mortgages and related activities.

¹⁷ Some of the largest mREITs are agency mREITs.

homeowners during the GFC, and subsequently went out of business. Following the GFC, several mREITs have developed business models that buy distressed mortgage assets (both residential and commercial) from banks and other lenders, helping to recapitalise the banking sector, and restructure and service these debts.¹⁸ By purchasing and recapitalising tens of billions of dollars' worth of these legacy MBS backed by troubled mortgages, mREITs have helped the banking sector to reduce risks, clean up balance sheets and strengthen resilience. mREITs have therefore played an important role in helping the financial sector to recover from the GFC and improve the ability to finance future growth of the US economy.

Commercial mREITs engage in a wide range of activities related to originating,¹⁹ funding, servicing, as well as restructuring and securitising loans secured by commercial real estate. Some commercial mREITs specialise in one or two of these activities, while others diversify their business activities. Also, some commercial mREITs hold physical commercial properties as investments.

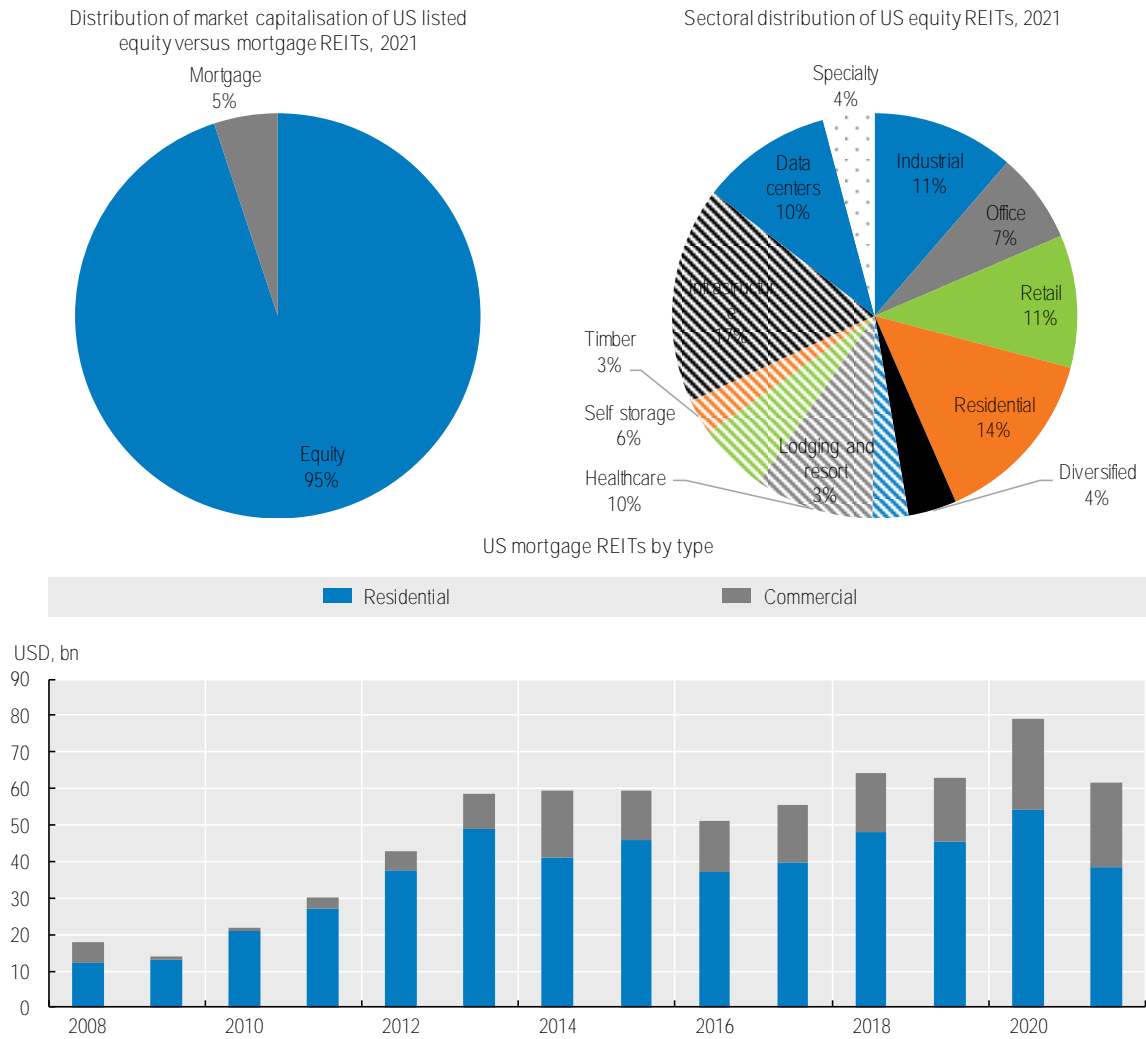
The majority of US publicly traded REITs are equity REITs (Figure 14) dominated by commercial REITs.²⁰ Nevertheless, the mREITs industry has expanded significantly in the United States since the GFC. Notably, the market capitalisation of US mREITs have increased from USD 18 billion in 2008 to USD 61 billion in 2021. US residential mREITs dominates, as they account for 63% of the market capitalisation of US mREITs in 2021, while commercial mREITs are expanding. mREITs have benefited since the GFC from a large amount of federal support for MBS that has been reinforced following the COVID-19 crisis (Pellerin et al., 2013). Notably, the US Treasury and the Federal Reserve have implemented actions that stabilised the MBS market and supported MBS prices, including large-scale purchases of MBS'. At end-2020, the Federal Reserve was the second largest holder of GSEs ABS after depository institutions, holding about 20% (i.e. USD 2.2 trillion) of total outstanding GSEs ABS (Figure 15).

¹⁸ Most residential mREITs (both agency and non-agency) do not originate mortgages, but are investors in MBS holding mortgages originated by other institutions. In addition to investing in residential mortgages and RMBS and MSR, some residential mREITs also invest in commercial mortgages and CMBS.

¹⁹ In contrast to their residential counterparts, commercial mREITs may originate and underwrite loans.

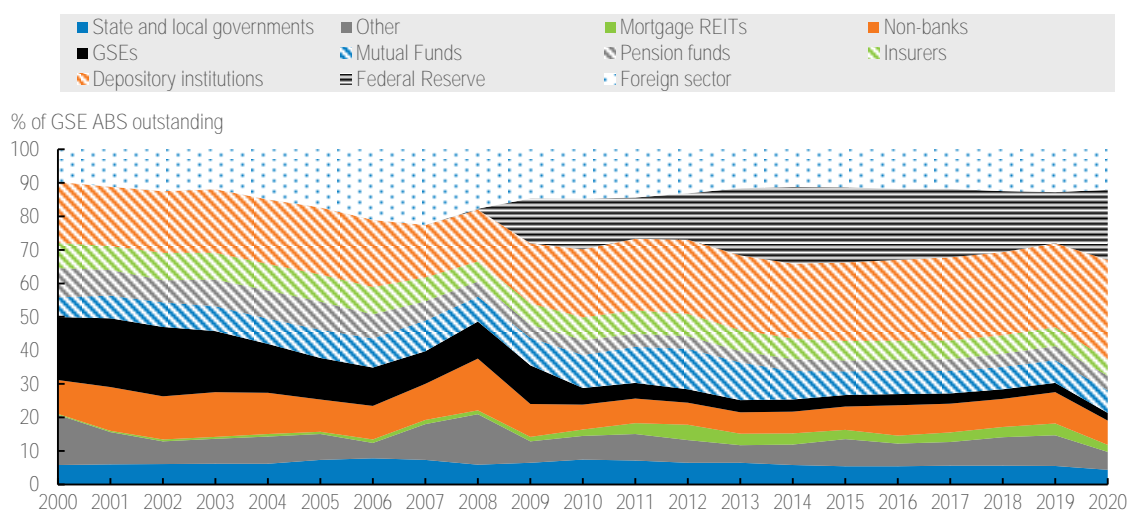
²⁰ In 2021, the market capitalisation of US listed equity REITs represents 95% of total US listed REITs and the market capitalisation of residential listed equity REITs accounts for 14% of total US listed REITs.

Figure 14. Market capitalisation of US equity versus mortgage REITs, 2008-2021



Note: These figures show aggregate market capitalisation of US equity versus mortgage REITs from the NAREIT REIT Market Database that includes all US REITs listed in the several sectoral FTSE Nareit US REIT indices.
 Source: REIT.com, Refinitiv, OECD calculations.

Figure 15. Distribution of US agency ABS outstanding by type of holder, 2000-2020



Note: These data have been sourced from the Board of Governors of the Federal Reserve System, Financial Accounts of the United States, Table L.211 (A).

Source: Federal Reserve, OECD calculations.

mREITs use short-term secured and/or bank revolving financing that combined with leverage contribute to boost downside risks

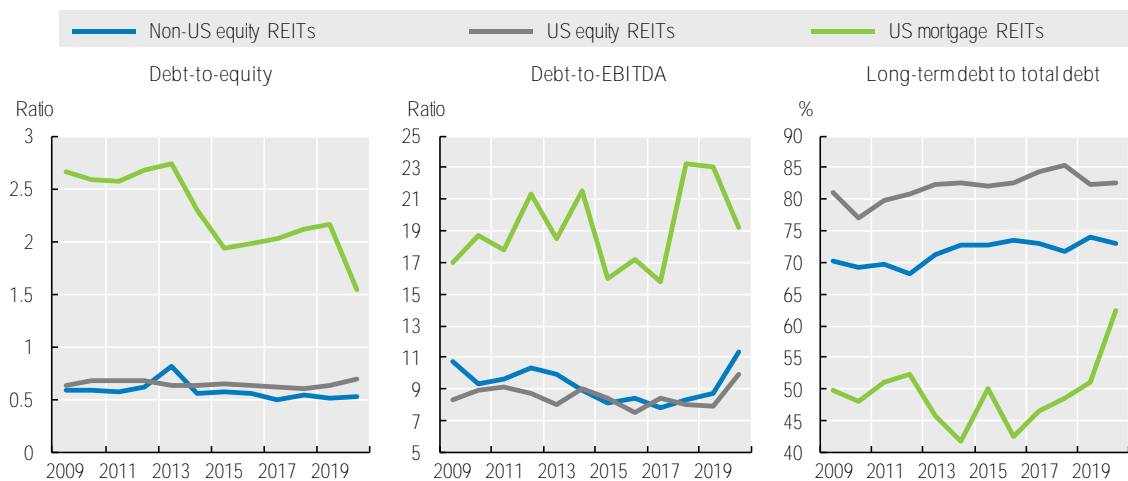
mREITs typically derive their returns from the income generated by underlying mortgages in their portfolios as well as changes in the mortgages' net present value. This is not dissimilar to equity REITs, which derive their returns from rents paid by tenants and the changes in the valuation of properties. Mortgages, however, tend to be much more liquid than physical properties, allowing mREITs some flexibility in managing their exposures and risks. In fact, many mREITs operate more like bond funds rather than property owners, actively turning over their portfolio of mortgages and exposures to respond to changing market conditions and expectations. Another feature of mortgages is that principal is repaid while conditional to a certain probability of default. Nevertheless, the value of physical properties is much more volatile and may generate either uncapped gains or become worthless.

mREITs use leverage, notably through revolving credit facilities from banks and other financial institutions, and also borrowing from short-term secured funding (i.e. also known as repo) and bond markets. Short-term secured financing provides mREITs funding at low interest rates to fund long-term assets that provide higher returns. To improve net interest margin, mREITs manage the spread between their cost of debt and the income received from their mortgage holdings. A common practice for mREITs is to multiply the difference between their short-term borrowing rates and long-term lending rates by adding leverage (Pellerin et al., 2013). In this process, the mREIT initially uses the cash it raised from investors and purchases MBS. Then it uses that MBS as collateral to borrow money to purchase more MBS', a process that it repeats multiple times. However, the number of rounds is limited as the repo lender requires a collateral margin on each loan, a gap that serves as a buffer for the repo lender's protection,²¹ or may impose covenants with regard to leverage.

²¹ Due to certain safe harbour provisions contained in the US Bankruptcy Code, the use of short-term secured financing to finance ABS, such as agency MBS, gives the lenders in the transaction disproportionately greater rights than typical borrowers in the event of default. For example, in a repo transaction, if the borrower defaults, the lender is not subject to the automatic stay (whereby creditors of a bankrupt firm are prevented, or "stayed," from making any attempts to

Leveraged mREITs may be vulnerable to a substantial rise in interest rates which could have negative implications for profitability and refinancing risk (Pellerin et al., 2013). Notably, maturing short-term funding may have to be rolled over into higher-interest rates that could contribute to an erosion of the profit margin of mREITs. More importantly, a substantial rise in interest rates may lead prices of outstanding MBS and the net present value of mortgages to fall, which could reduce the value of mREITs' assets, both those that are used as collateral for short-term secured financing (i.e. encumbered assets) and those that are not (i.e. unencumbered assets). Concerns arise from the declining value of assets used as collateral to obtain short-term secured funding as mREITs may be subject to margin calls. Deteriorating financial soundness of mREITs may force them to deleverage that could amplify a price decline of MBS possibly leading to substantial losses for a wide range of financial intermediaries and investors exposed to these markets. If the value of assets put as collateral declines enough that margin calls exceed an mREIT's unencumbered assets, the mREIT would likely default. Increasing creditors' concerns about the financial soundness of mREITs could amplify the refinancing risk of mREITs following both an increase in interest rates on short-term secured funding and collateral margins. Therefore, a negative shock or adverse investor sentiment may leave mREITs exposed to the risk that their cost of funding could rise to levels that could fairly quickly make them insolvent, or at which their creditors might simply refuse to lend. The fact that mREITs must, among other requirements, distribute at least 90% of each year's income to their owners in order not to be subject to federal corporate income taxation leaves them with modest buffers to meet their commitments in stressed conditions.

Figure 16. The leverage and debt maturity profile of equity versus mortgage REITs, 2009-2020



Note: These figures show leverage and long-term debt ratios of publicly traded equity and mortgage REITs globally. Leverage ratio is calculated using two approaches, either considering the ratio of total debt to total equity or the ratio of total debt to EBITDA (including only REITs with positive EBITDA in the calculation of the average ratio). Financial statement data are sourced from Refinitiv in 2009 and 2020. The sample includes 194 US equity REITs, 589 equity REITs in other advanced and emerging economies and 47 US mREITs.

Source: Refinitiv, OECD calculations.

Figure 16 shows that mREITs are more leveraged than equity REITs both in the United States and in other advanced and emerging economies. Nevertheless, the leverage of US mREITs has declined in recent years while it has remained almost stable for equity REITs globally. Also, average debt-to-equity ratios of equity REITs are below one suggesting that they rely more on their capital base than debt financing.

collect what they are owed) provisions of the code and can take possession and immediately liquidate the assets pledged as collateral under the repurchase agreement.

Importantly, US mREITs rely more on short-debt financing compared to equity REITs, yet mREITs have lengthened the maturity of their funding in recent years.

mREITs are exposed to several types of risks, including interest rate, credit and liquidity risks

mREITs, like any other financial intermediaries, face certain types of risks but most employ hedging techniques. Nevertheless, mREITs have been under pressure in past crisis episodes such as the GFC and more recently during the COVID-19 crisis (Nareit, 2018 ; and Frame et al., 2021). The main types of risks faced by mREITs include:

- *Interest rate risk:* managing the effects of changes in short- and long-term interest rates is an essential element of mREITs' business operations. Changes in interest rates can affect the net interest margin, which is mREITs' fundamental source of earnings, but also may affect the value of their mortgage assets and MBS collateral that may potentially result in a run on their short-term liabilities and a large scale sell-off in the agency MBS market (Frame and Steiner, 2018). mREITs typically manage and mitigate risk associated with their short-term borrowings through conventional strategies, i.e. including interest rate swaps, swaptions, interest rate collars, caps or floors and other financial future contracts. mREITs also manage risk in alternative ways, such as selecting specific MBS investments based on the likely prepayments of mortgages in the pool under alternative interest rate environments,²² adjusting the average maturities on their assets as well as their borrowings, and selling assets during periods of interest rate volatility to raise cash or reduce borrowings.
- *Credit risk:* mREITs are also exposed to credit risk through their direct mortgage lending or MBS investment. Only RMBS issued by US agencies present limited credit risk. Currently, the bulk of US MBS purchased by residential mREITs are agency securities backed by the federal government, as most RMBS issued in the United States are issued by agencies, which are undeniably safer than it was a decade ago with improved credit standards and regulatory framework and oversight.
- *Funding or liquidity risk:* mREITs are inherently exposed to funding or liquidity risks through their business model. In fact, mREITs assets are mainly longer-term MBS and mortgages, while their liabilities may include a significant amount of short-term secured financing. This maturity mismatch requires short-term debt rollover which is highly dependent on the liquidity of short-term secured debt markets.

While mREITs are susceptible to various risks, it is less clear whether these risks may become systemic (Pellerin et al., 2013). Following an unexpected adverse shock, mREITs may be forced to deleverage. This is likely to drive down further MBS valuations. That in turn would affect the balance sheets of MBS investors, cause repo lenders to pull back funding or raise rates where MBS collateral is involved, and drive-up mortgage interest rates. Also, deterioration of mREITs financial soundness may impact banks. Despite the weakening active role of banks in the mortgage market following the GFC, revolving credit facilities provided to REITs are making these same investment.

mREITs have experienced margin calls following MBS price declines in March 2020 and subsequent deleveraging has created a feedback loop in the agency MBS market

The occurrence of the COVID-19 outbreak in March 2020 triggered a bout of risk aversion following rising uncertainty that resulted in higher yields and material selling pressures on US Treasury and agency MBS markets. Therefore, market prices of securities have declined and become more volatile as market participants sought liquidity. Also, the traditionally stable pricing relationship between different mortgage pools has been disrupted. These various market movements, while not large in absolute terms,

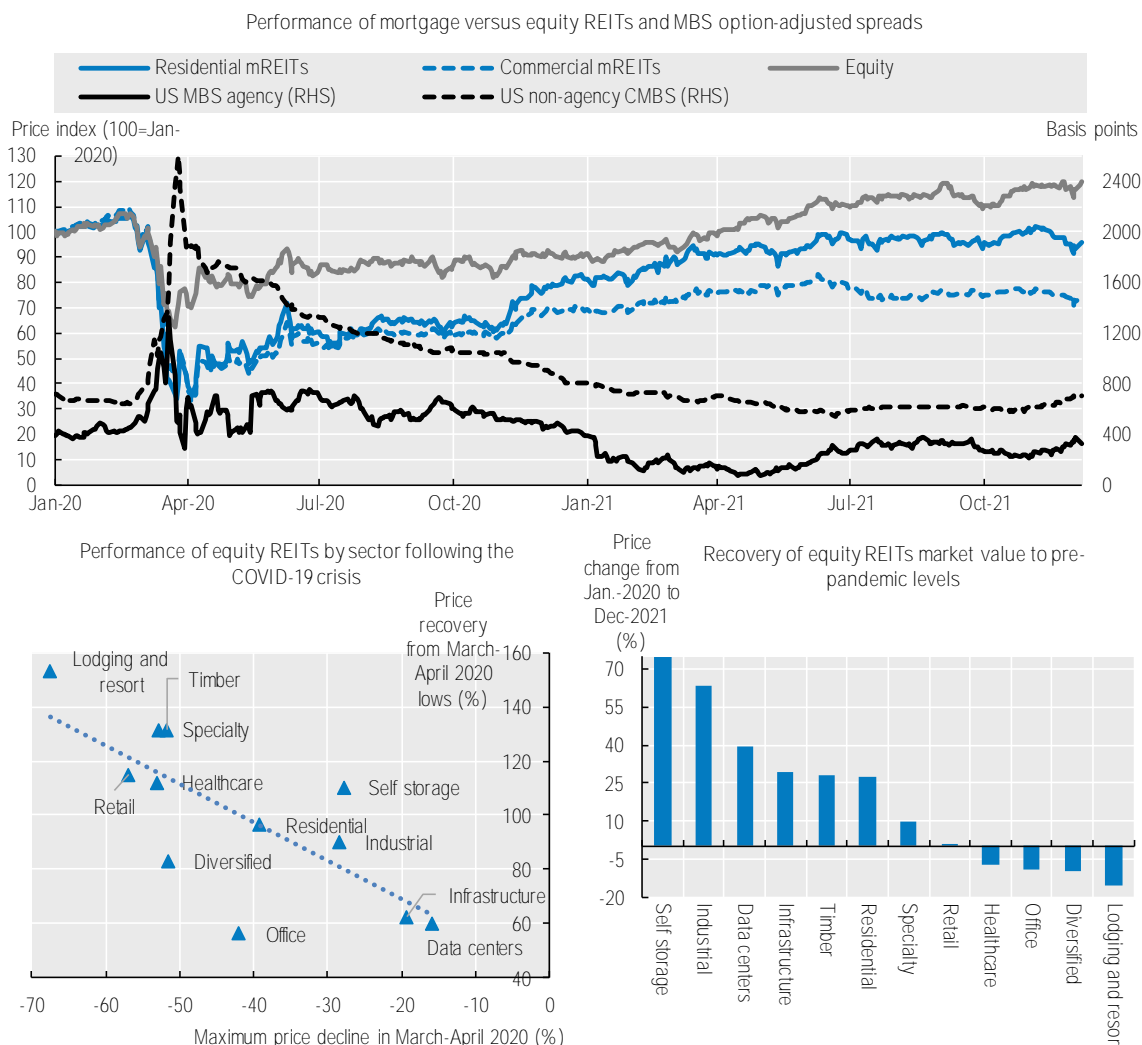
²² When such a refinancing or repayment occurs, mREITs holding the mortgage or MBS must reinvest the proceeds into the prevailing interest rate environment, which may be lower or higher. mREITs also lose the investment premiums of MBS that prepay at par.

disproportionately and adversely affected levered participants such as mREITs (Nareit, 2020; and Investment Company Institute, 2020). In particular, leverage and maturity transformation render mREITs more vulnerable to significant shocks to the value of MBS securities as a result of changes in interest rates or adverse conditions in the real estate market. The deterioration the credit quality of underlying mortgages triggered a decline in MBS prices and of premiums in the pay-up market where the mREITs were long, which increased mREITs' leverage to unsustainable levels. Lenders on short-term secured funding markets demanded extra collateral and several large US mREITs announced that they were unable to meet margin calls (Financial times, 2020). In turn, various mREITs had to unwind their positions in agency MBS'. Such liquidity shortages have contributed to sharp falls in the market value of mREITs (Figure 17). While the mREIT market itself is not large, deleveraging created a feedback loop in the agency MBS market (SEC, 2020b).

The Federal Reserve's direct intervention, including purchasing of agency MBS', in conjunction with regulatory actions such as providing interim capital relief to banks to expand their ability to engage in market intermediation, helped to stabilise the MBS market and also short-term secured funding markets. In addition, such policy actions combined with unprecedented fiscal support and loan forbearance measures helped to improve substantially credit market conditions in real estate finance markets (OECD, 2021a), as reflected by the decline of US agency MBS and non-agency CMBS option-adjusted spreads that supported the gradual recovery in REITs valuations.

Recovery in the REIT sector continues in 2021, but at a slower pace than the rapid recovery during the initial phase of reopening in the second half of 2020. In large part, this deceleration reflects the wide range of outcomes across different property types (Nareit, 2021a). Notably, commercial mREITs face the most challenging conditions as recovery in commercial real estate is uneven across economic sectors and subject to various lags and delays. Hard-hit sectors such as lodging and resorts, retail, timber, specialty and healthcare sectors, experienced the largest initial stock market declines early in the pandemic, but staged a vigorous recovery following the announcement of successful tests of vaccines against COVID-19 during the fourth quarter of 2020. These sectors nevertheless generally remain currently below pre-pandemic prices. The office sector is facing particularly challenging conditions in the post-COVID 19 crisis environment as reflected by the sharp price decline in March-April 2020 and the weak recovery since March 2020 lows compared to other sectors. Office markets face both short-term issues from a delay in workers' return to office, and also possible longer-term structural issues caused by permanent shifts in demand for office space due to increasing work from home trends. In contrast, sectors that support the digital economy have enjoyed booming demand in 2020 that appears to remain robust even as the pandemic wanes. Besides, higher expected inflation during the post COVID-19 crisis period is not likely to be a headwind for REITs. Historically, real estate and REITs have been resilient during periods of inflation as both rents and real estate values tend to increase along with broader price levels, providing real estate owners with higher nominal revenues and collateral values, albeit in inflated dollars (Nareit, 2021b).

Figure 17. Performance of US REITs and MBS spreads, 2020-2021



Note: In the bottom left chart, the performance of FTSE Nareit US equity and mREITs (i.e. residential versus commercial) indices are shown along with US agency MBS and US non-agency CMBS option adjusted spreads derived from Bloomberg Barclays indices. In the middle chart, sectoral FTSE Nareit US equity REITs indices have been used to calculate the maximum price decline over the period from beginning of March to end of April 2020 and the price recovery since lows reached during this period in 2020 and end-December 2021. The bottom right chart shows price recovery of sectoral FTSE Nareit US equity REITs indices between July 2021 and pre-pandemic levels (i.e. January 2020). Source: Refinitiv, OECD calculations.

Developments at the onset of the pandemic suggest that structural vulnerabilities remain in the mREIT sector that was deeply affected by and contributed to price volatility in MBS markets. Assessments by the Financial Stability Board (2020a) suggest that actions could also be taken to reinforce the resilience of NBFIs and assess market participants' ability to meet margin calls. Mitigating excessive leverage in funds that invest in core bond markets is also being mentioned. By contrast, industry bodies and market participants note that the broader context of the market ecosystem should be taken into consideration (PIMCO, 2021), such as the persistent reach for yield of many investors that has contributed to elevated asset prices, with possible market corrections, and rising debt levels that can add pressure to abrupt changes in risk sentiment.

2.4. Real estate mutual funds

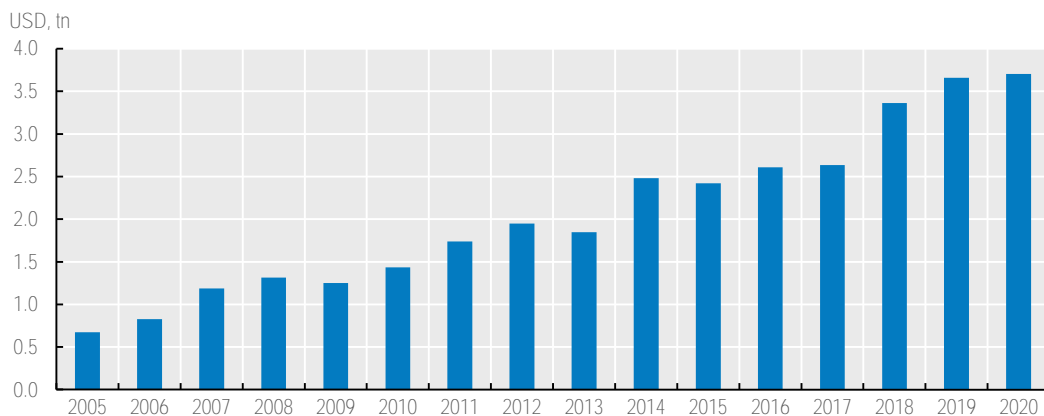
While a REIT can be considered as a mutual fund of real estate properties, a REMF can be viewed as a fund of funds²³

A REMF is a professionally managed portfolio of diversified holdings. Most funds typically invest in a combination of REIT stocks and real estate related stocks or bonds. Unlike REITs which invest in physical real estate assets or real estate MBS and mortgages, a REMF gives investors an opportunity to invest in the real estate market with returns based on tracking returns of trusts that have direct exposure to real estate related securities or properties. With the development of exchange traded funds (ETFs), some REMF are listed on a stock exchange. Real estate-focused ETFs provide investors liquid investments by offering redemptions at higher frequencies and at fund current net asset value (NAV),²⁴ which can expose them to liquidity transformation risk (Clark and Biskupska-Haas, 2017).

The REMF management industry has experienced considerable growth over the last decade while liquidity transformation risk at leveraged open-ended funds (OEFs) could threatened financial markets' resilience

According to the ANREV/INREV/NCREIF²⁵ Fund Manager Survey 2021, total REMFs' assets under management (AUM) have more than doubled over the last decade and have risen to historical highs in 2020 standing at USD 3.7 trillion (Figure 18). The REMF industry is concentrated at the top of the rankings as the 10 largest managers represent 37% of the overall AUM. Nevertheless, there are some variations across investment strategies worth noting. The two largest managers among Asia Pacific strategies are substantially larger than their peers, while there is less variation among the top 10 managers for European and North American strategies. Non-listed REMFs (including investment funds, separate accounts, club deals, debt funds and funds of funds) represent the largest share of total AUM that account for 83% of total AUM.

Figure 18. Asset under management of real estate mutual funds globally, 2005-2020



Source: The ANREV/INREV/NCREIF Fund Manager Survey 2021.

²³ Kallberg et al. (2000).

²⁴ NAVs are calculated once a day and are based on the closing prices of the securities in the fund's portfolio.

²⁵ INREV is the European association for investors in non-listed real estate vehicles. ANREV is the Asian association for investors in non-listed real estate vehicles. NCREIF is the US national council of real estate investment fiduciaries. The three regional associations, INREV, ANREV and NCREIF have signed a Global Alliance Memorandum of Understanding in May 2020 to advance the global agenda of transparency, accessibility and professionalism and increase harmonisation across the non-listed real estate industry.

REMFs partly finance their activities using debt, and sometimes operate with high level of indebtedness compared to other investment funds (ESRB, 2018). In addition, even if the segment of publicly traded REMFs is relatively small, share redemptions from open-ended REMFs make them vulnerable to market stress if investors engage in a wave of redemptions to exploit a perceived first mover advantage. All these factors combined have the potential for contagion to other markets, depending to the intensity of investors' panic and fund leverage (Bank of England, 2019). If large redemptions occur, funds may attempt to use a liquidity waterfall strategy to meet increased redemption demand using cash and cash equivalents. Nevertheless, such cash buffers may prove to be insufficient. Subsequently, REMFs may have to sell assets into increasingly illiquid markets. REMFs would experience large discounts on their sales and/or trigger price spirals (IMF 2015a, 2015b; and Bank of England, 2019).²⁶ Besides, a deterioration of real estate prices may lead to lower returns for REITs and therefore for REMFs that may experience financial distress depending on the extent of their leverage. Fire sales by funds could have an impact on other financial intermediaries by triggering price spirals in the markets to which such funds are highly exposed. Notably, sales of illiquid REIT stocks or real estate related stocks or bonds may exceed the ability of dealers and other investors to absorb them, amplifying price movements, transmitting stress to other parts of the financial system, and disrupting the availability of finance to the real economy.

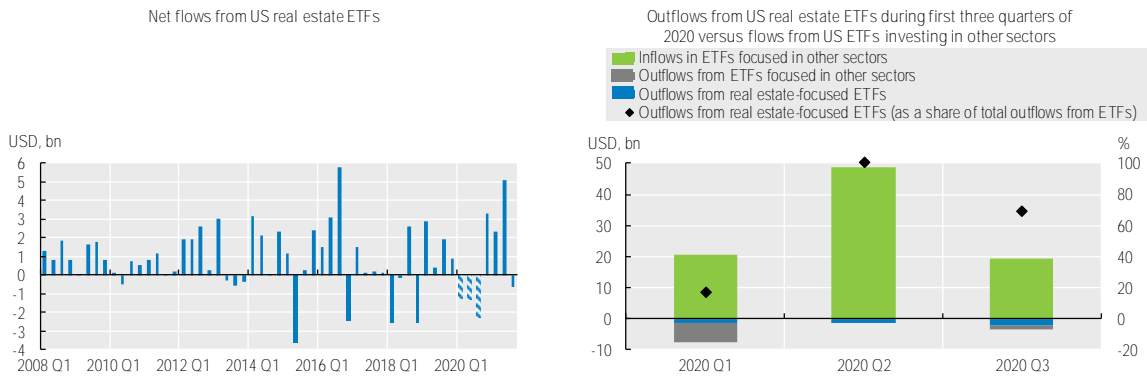
Events such as massive suspensions of redemptions among UK real estate funds following the Brexit referendum in June 2016 or substantial outflows from UK commercial real estate funds in late 2018 and early 2019, partly related to uncertainty about Brexit, provide evidence of how those risks could materialise and cause subsequent spillover effects. Investment Association (IA) figures show a sharp rise in redemptions from UK Direct Property sector funds with net outflows of GBP 336 million during the fourth quarter of 2018, and net inflows over the first three quarters of 2019 of only GBP 37 million (Investment Association, 2019). This is far lower than the outflows of nearly GBP 2 billion from IA UK Direct Property sector funds in 2016. While the level of liquid assets in UK commercial property funds was better in December 2018 than in June 2016, the Financial Conduct Authority (FCA) suggested that commercial property funds should stop trading when there was considerable uncertainty over the value of their investments, meaning this became their first response rather than last resort.

Unprecedented monetary and fiscal support measures combined with persistent low interest rates and investors' continued hunt for yield have supported the recovery of the REMF industry following the COVID-19 shock

With COVID-19 induced financial market volatility, investor de-risking and the scramble for cash triggered massive outflows from bond and equity market investments, including those held through mutual funds and ETFs, balanced by strong inflows into assets like cash and money market funds backed by US government agency or Treasury securities beginning in March 2020 (SEC, 2020a). Notably, US real estate-focused ETFs experienced USD 5 billion of net outflows during the first three quarters of 2020, an equivalent of 40% of total outflows from US ETFs (Figure 19). In comparison, commodities and technology-focused ETFs collected USD 50 and 14 billion of net inflows respectively in the same time period as investors sought safer investment alternatives within the market (S&P Global Ratings, 2020d). Such flight-to-safety investment dynamics prompted a sharp decline in the market value of real estate ETFs of 42% between end-February and end-March 2020 (Figure 20).

²⁶ The Bank of England (2019) has found that investors in funds investing in less liquid assets, such as commercial real estate and corporate bonds, can be more sensitive to asset price moves.

Figure 19. Investment flows to US real estate-focused ETFs, 2008-2021



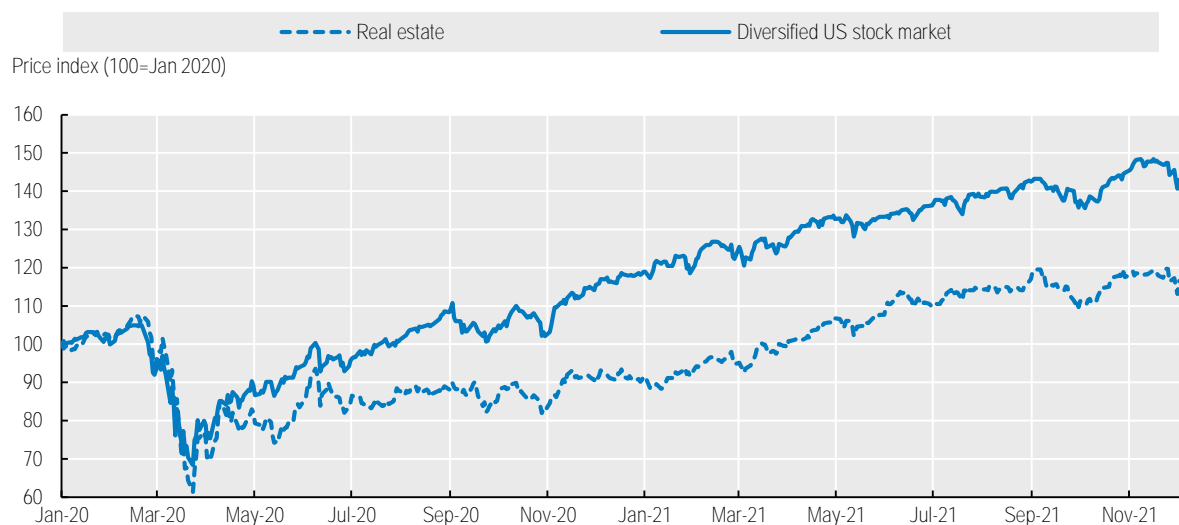
Note: In the left chart, net flows are calculated as the difference between gross issuance of ETFs shares and gross ETF share redemptions using monthly data. In the right chart, ETFs focused in other sectors invest either in consumer, financial, healthcare, technology, utilities, natural resources or commodities sector.

Source: Investment Company Institute, Refinitiv, OECD calculations.

Unprecedented monetary and fiscal support measures combined with substantial progress in the COVID-19 vaccine rollout have contributed to improved conditions in real estate finance markets that have supported the gradual recovery in real estate-focused ETF valuations and inflows. Investors’ incessant hunt for returns is also likely playing into this, as many have rotated into cyclical sectors that have benefited from gains in economic recovery momentum, particularly utilities, consumer staples and real-estate sectors. Also, real estate assets would offer some hedging protection in a context of rising expected inflation. The increasing demand from housing to commodities while physical real-estate assets’ supply remains relatively low would result in rising costs of both building materials and construction that combined with labour shortages would leave part of the demand to go unmet (US Chamber of Commerce, 2021). Similar to trends in markets for semiconductors, where a global shortage prompted substantial increase in market prices since March 2020,²⁷ REITs and REMFs are likely to be seen as more valuable particularly as more of the economic recovery would gain momentum (BlackRock, 2020a; and Bloomberg, 2021b).

²⁷ Using Refinitiv global semiconductor benchmark, price index has risen by 145% since March 2020 lows to end of September 2021.

Figure 20. Performance of US real estate-focused versus diversified stock market ETFs, 2020-2021



Note: This figures shows the evolution of market prices of Vanguard real estate-focused versus diversified US stock market ETFs.
Source: Refinitiv, OECD calculations.

However, persisting uncertainty about the emergence of COVID-19 variants and their implications for the economic outlook and remaining elevated delinquency rates in certain affected sectors are still concerning, which could contribute to the weakened performance of real estate focused-ETFs compared to diversified US stock market ETFs. Importantly, while long-term treasury yields remain very low, making real estate investments attractive, an increase in interest rates following policy rate normalisation, may have negative implications for the sector. For instance, declining MBS prices following a rise in interest rates may result in higher refinancing risk for leveraged mREITs. Deteriorating financial soundness of mREITs would also contribute to weakened performance that may trigger losses for REMFs and redemptions from investors. If large redemptions occur, REMFs might not be able to sell assets quickly enough without experiencing large discounts on their sales that could amplify their need for deleveraging. Massive deleveraging of REMFs could contribute to a further erosion of the value of mREITs and exacerbate their refinancing risk. Collapse of mREITs and REMFs combined with subsequent price spirals on MBS markets would result in significant losses for a wide range of financial intermediaries and investors exposed to these markets.

3

The rising importance of non-bank mortgage intermediation in real estate finance

This section outlines the shifting structure of mortgage credit intermediation characterised by the rising importance of non-bank US mortgage originators and servicers – in addition to REITs, REMFs and other market vehicles – that has also contributed to the growth and exuberance of the real estate finance markets. It describes major global trends in non-bank mortgage financing (including from insurance companies, pension and investment funds) and the main risks associated that may involve regulatory arbitrage. Notably, the section discusses the major liquidity vulnerabilities associated with non-bank mortgage lenders in the mortgage market, along with solvency issues that could trigger or compound these liquidity issues, with potential negative implications for financial resilience.

3.1. Global trends in non-bank mortgage intermediation and fintech lending

One notable structural shift in mortgage lending in the post GFC era has been the rise of non-bank mortgage originators, with less stringent borrowers' credit standards, as an alternative to traditional bank mortgage lending

Traditional bank lenders, notably highly regulated banks and other depository institutions, continue to provide origination, funding, and often servicing. They fund mortgage originations with deposits or marketable debt, and they either hold the loans in a portfolio or securitise them in pools, mostly guaranteed by government agencies in the United States. Nevertheless following the GFC, more stringent capital requirements on mortgage lending activities have weakened banks' incentives to increase their lending (Buchak at al., 2018). As a consequence, a second part of the mortgage market has risen including non-bank mortgage originators and servicers, insurance companies, pension funds and investments funds. This new aspect of the mortgage market may represent a substantial share of the market depending on the jurisdiction and the real estate sector considered.

The rising importance of credit activities of alternative lenders has several potential benefits. Firstly, the entrance of such non-bank competitors leads to more competition and diversification in the financial sector.²⁸ Secondly, a larger role for pension funds and insurance companies lowers the need for maturity transformation in this market and could hence lower funding problems and systemic risks. Thirdly, as non-bank mortgage lenders do not create money but rather have a limited amount of funds, their lending could potentially be less procyclical.

In the United States, non-bank mortgage lenders differ from banks both in the types of mortgages that they originate and in the types of borrowers that they serve. Non-bank mortgage lenders have widely adopted

²⁸ For example, the margins on annuity mortgages declined steeply the past years in the Netherlands (the part of the mortgage market where NBFIs are most active). For further details, please see DNB (2020).

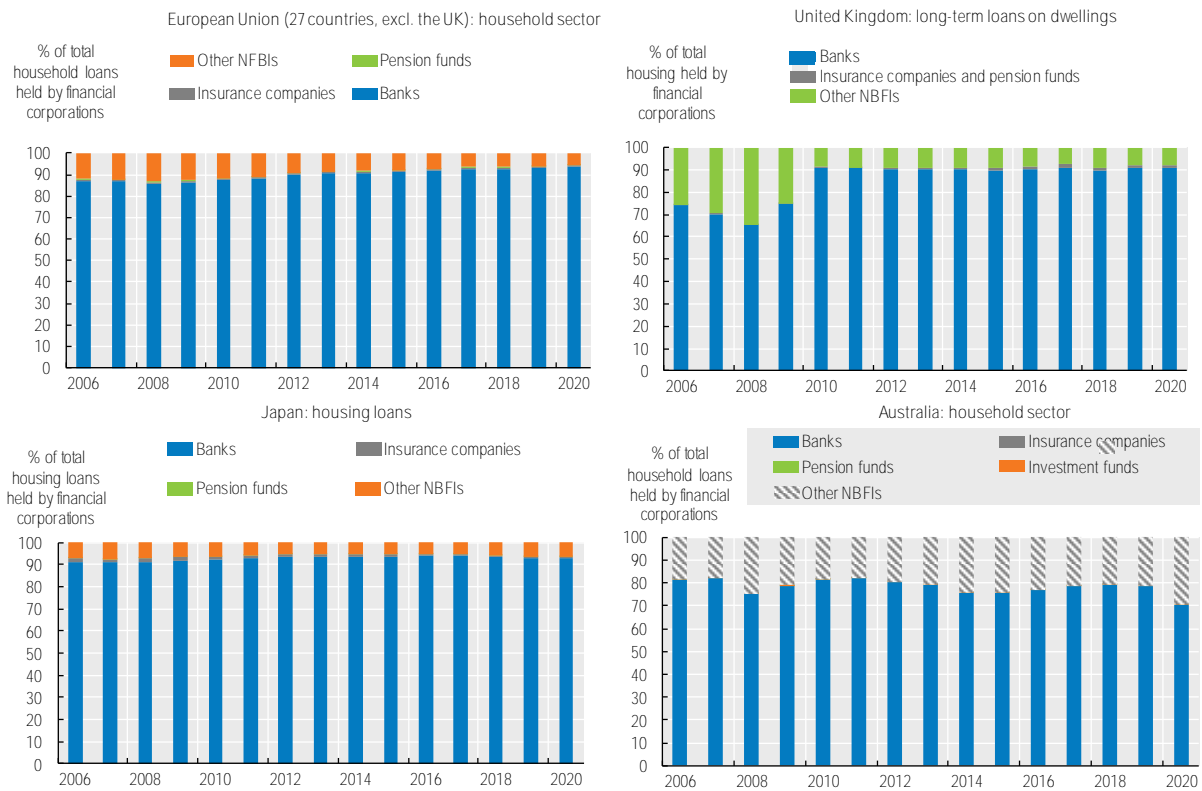
the originate-to-distribute business model. This model does not incentivise non-bank mortgage lenders to consider stringent borrowers' credit standards (Purnanandam, 2011). Some empirical evidence shows that mortgages originated by non-bank mortgage lenders are of lower credit quality than those originated by banks (Denis and Mihov, 2003; and Buchak et al., 2018). In particular, non-bank mortgage lenders are more likely to originate mortgages to borrowers who are members of minority groups, who have lower incomes, and who have lower credit scores (Kim et al., 2018). Non-bank mortgage lenders may also be susceptible to investors' sentiment and hence swings in their credit risk appetite resulting in credit provision that is more procyclical (BIS, 2020a). These effects may be exacerbated for borrowers with low credit scores and who may only have access to non-bank lending companies. Should a reduction in the supply of non-bank lending occur, these borrowers may be unable to secure alternative sources of funding and would find themselves in liquidity stress, which could subsequently lead to a contraction in the real economy.

The rise of non-bank mortgage origination and servicing has occurred at very different speeds across jurisdictions and real estate sectors in the post-GFC era

Shares of non-bank residential mortgages have remained stable in most major non-US mortgage markets since the GFC and stand at moderate levels. Notably, the share of non-bank residential mortgages remain under 10% in Japan, the United Kingdom and the European Union in 2020 (Figure 21). In Australia, while non-bank residential mortgages represent a substantial share of overall housing lending (i.e. at 30% in 2020), these trends are mainly resulting from substantial holdings of housing mortgages by securitisers that buy mortgages originated by other financial institutions through the housing mortgage securitisation process.

While non-bank housing finance is moderate on average in the European Union (excluding the United Kingdom), there is a high heterogeneity across European economies (Figure 22). In certain European economies, the share of non-bank housing loans exceeds the regional average (i.e. Sweden, Netherlands, Ireland, Belgium, Latvia, Italy, Estonia, Bulgaria and Slovenia) characterised by substantial financing shares from insurance companies (i.e. Netherlands, Belgium, Germany), pension funds (i.e. Netherlands, Germany, Cyprus) and investment funds (i.e. Ireland, Netherlands, Belgium, Latvia, Italy, Estonia, Slovenia).

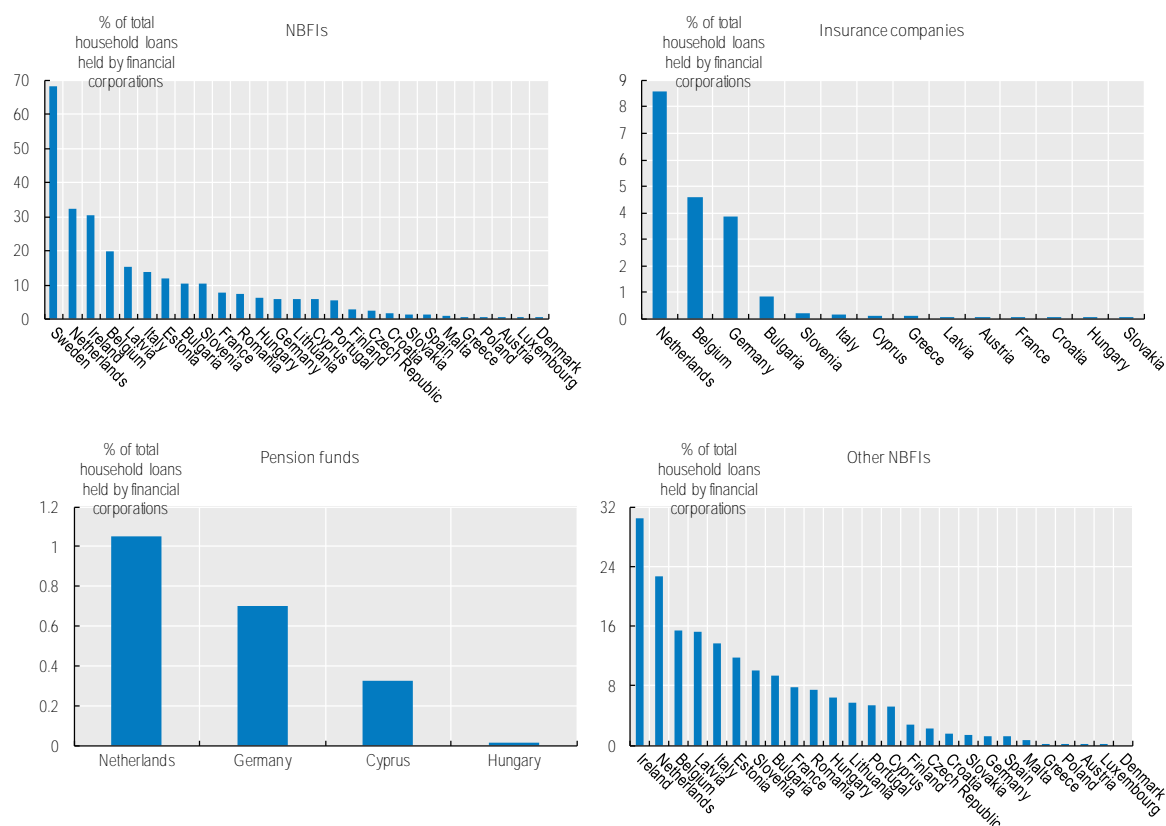
Figure 21. Residential mortgages by type of lender in selected major real estate finance markets, 2006-2020



Note: These figures show flow of fund data stocks for selected major real estate finance markets. In the European Union (excluding the United Kingdom), other NBFIs refer to other financial institutions (i.e. financial corporations other than monetary financial institutions, insurance corporations, private pension funds and non money market investment funds). In Japan, other financial intermediaries include securities investment trusts, finance companies and structured financing special purpose companies and trusts. In the United Kingdom, other non-bank mortgage lenders refer to specialist lenders. In Australia, other NBFIs include central borrowing authorities, securitisers and other financial corporations.

Source: ECB, Bank of Japan, ONS, Australian Bureau of Statistics, OECD calculations.

Figure 22. Residential mortgages by type of lender in selected European Union economies, 2020



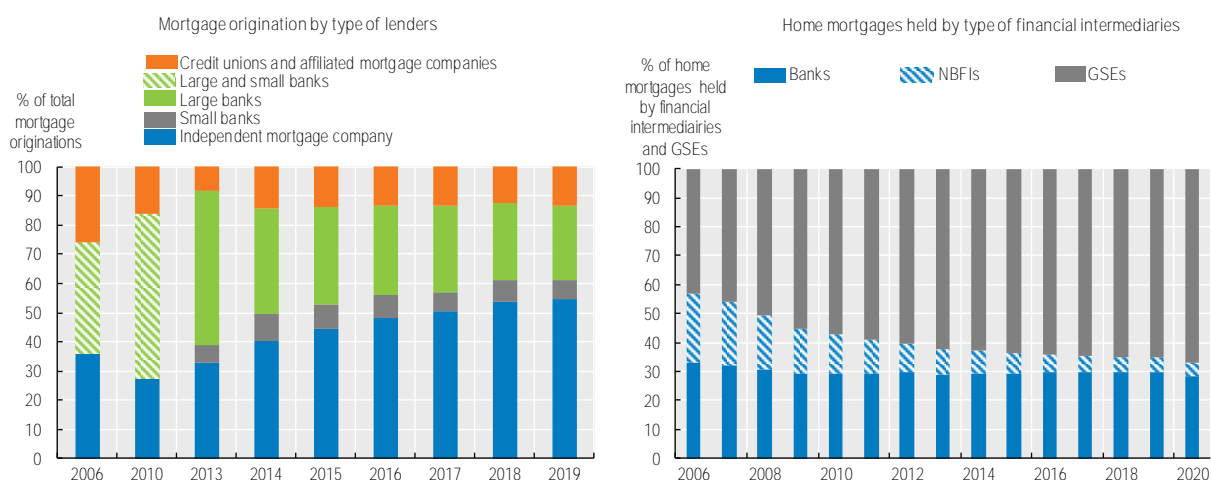
Note: These figures show flow of fund data stocks for European Union economies excluding the United Kingdom. NBFIs include insurance companies, pensions funds and other NBFIs. Other NBFIs refer to other financial institutions (i.e. financial corporations other than monetary financial institutions, insurance corporations, private pension funds and non money market investment funds). Countries with a null ratio are not shown.

Source: ECB, OECD calculations.

In contrast, housing mortgages originated by non-bank mortgage lenders have increased substantially in the United States and China since the GFC and stand at elevated levels in both jurisdictions. In the United States, housing mortgages originated by non-bank mortgage lenders²⁹ rose from 30% in 2010 to 55% of total origination in 2019. In contrast, banks' market share has fallen below 50% since 2014 (Figure 23). While non-bank mortgage lenders were the largest purchasers over the period of 2004-2007, government agencies (including Fannie Mae, Freddie Mac and Ginnie Mae) are currently dominant. Nevertheless, Fannie Mae and Freddie Mac are hedging credit risk through private mortgage insurance (PMI) and by issuing credit risk transfer securities (CRTs). Private mortgage insurers are prone to financial losses and subsequent rating downgrades following an increase in borrower's default. Also, the fact that CRTs are leveraged by some market participants is likely to potentially transfer risk and stress to other markets following an unexpected shock (Box 2).

²⁹ For the United States, mortgage origination are considered by type of lender rather than their holding of mortgage loans. Given the size of securitisation markets, most financial institutions are not holding the loans they are originating on their balance sheet. Also, given the specialness of the US housing finance market with the existence of government agencies, loans originated by banks and NBFIs may be purchased by government agencies.

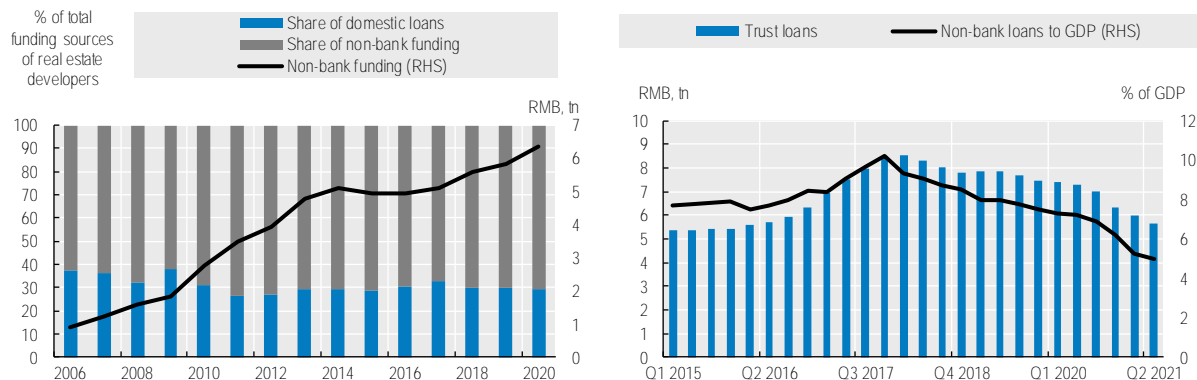
Figure 23. US residential mortgage originations by type of lender and holding by type of financial institution, 2006-2020



Note: In the left chart, small banks consist of those banks with assets (including the assets of all other banks in the same banking organisation) of less than USD 1 billion at the end of 2019. Affiliated mortgage companies are non-depository mortgage companies owned by or affiliated with a banking organisation or credit union. In the right chart, flow of fund data stocks have been used to derive the distribution home mortgages held by the several types of financial institutions in the United States.

Source: Consumer Financial Protection Bureau, Home Mortgage Disclosure Act database, Federal Reserve, Refinitiv, OECD calculations.

Figure 24. Sources of funding of Chinese real estate developers and trust loans, 2006-2021



Note: In the left figure, shadow funding includes self-raised funds and financing from foreign investors. Sources of funding of Chinese real estate developers excludes

Source: The Peoples' Bank of China, Refinitiv, OECD calculations.

In China, sources of funding for real estate developers mainly include non-bank financing. Notably, self-raised financing, that include equity IPOs, corporate bond issuance and loans from trust companies (BIS, 2019b), represented 70% of total sources of funding for real estate developers in 2020 (Figure 24). Nevertheless, the COVID-19 crisis has accelerated the decline in trust loans that already started since end-2017. Considering the deterioration of the financial soundness of Chinese real estate developers and the substantial portion of real estate financing from the non-bank financial sector, the China Banking and Insurance Regulatory Commission has introduced in 2019 more explicit caps on real estate financing for trust companies to prevent them financing property developers that did not have all necessary licenses or met requirements on shareholders and capital (S&P Global Ratings, 2020c). Therefore, Chinese real

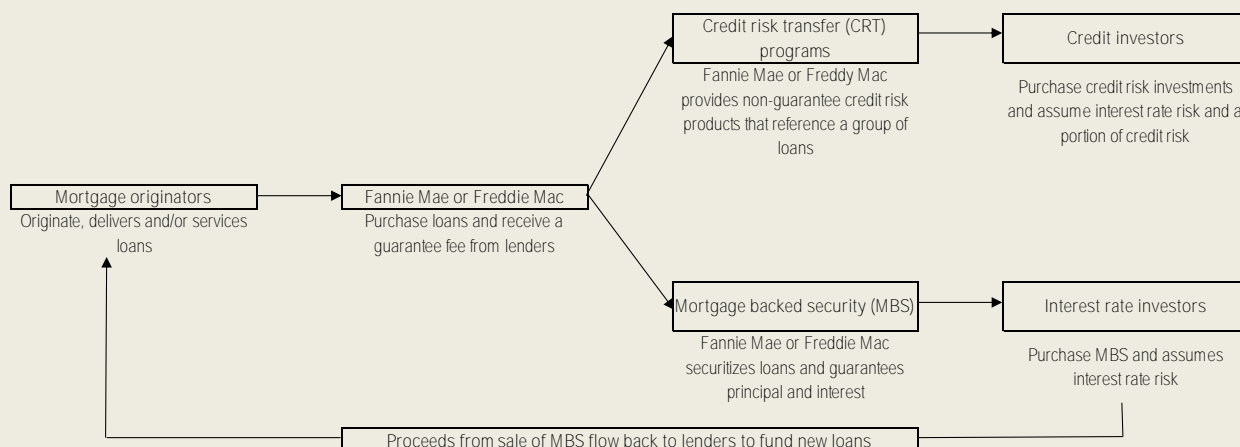
estate developers are increasingly relying on capital markets to raise funding that face rising downside risks would real estate developers' credit quality continue to deteriorate.

Box 2. Vulnerable US residential mortgage market through linkages with PMI and CRTs

The GFC resulted in substantial amount of losses for GSEs. In September 2008, Fannie Mae and Freddie Mac have been placed under the conservatorship of the US Treasury that has posed risks to US taxpayers. Credit risk transfer securities were created in 2013 following guidelines by the Federal Housing Finance Agency (FHFA) for governing single-family credit risk sharing by Fannie Mae and Freddie Mac with the intent of reducing their overall risk and, therefore, the risk for US taxpayers through the development of broad and liquid credit markets to help build a stronger housing finance system. In addition to CRTs, GSEs also mitigate and transfer risk through private mortgage insurance (PMI) and re-insurance of mortgage pools.

CRTs are like typical MBS issued by Fannie Mae and Freddie Mac but the main difference is that the full repayment of the original principal balance of CRTs is not guaranteed (Figure 25). Whereas the MBS issued by Fannie Mae and Freddie Mac do not entail meaningful credit risk, CRT do entail substantial credit risk. CRT are issued in tranches that cover a range of cash flows, credit risk and potential return profiles. Historically, tranches with the highest credit quality have been rated A and feature a relatively short expected cash flow window and a large amount of credit protection in the form of a higher level of subordination. BBB rated tranches feature longer expected cash flow windows and lower levels of subordination. Finally, unrated tranches represent the longest expected cash flows and have the least credit protection, but typically offer the highest potential returns. Tranche prepayments and write-downs are based on the performance of the reference mortgage loan pool. Credit risk transfer is achieved by writing down the outstanding principal balance of the CRT based on the performance of the reference mortgage loan pool. As loans are prepaid, the most senior tranche is first in line to receive the proceeds, followed by lower-rated tranches as outstanding balances are paid off. As defaults occur, losses are allocated sequentially from the tranches with the lowest rating to the highest. Thus, unrated tranches experience write-downs, first, and if they are written down entirely, BBB rated tranches begin to take write downs, etc... Fannie Mae and Freddie Mac offset credit losses on the related loans by reducing the amount they are obligated to repay to CRT holders. Investors in CRTs include hedge funds, REMFs, REITs, registered investment companies (RICs), insurance companies and banks.

Figure 25. MBS and CRT transactions of Fannie Mae and Freddie Mac



Source: Fannie Mae, OECD.

From the beginning of CRT programs in 2013 through the end of 2019, Fannie Mae and Freddie Mac have transferred a portion of credit risk on approximately USD 3.5 trillion in single-family loans through CRT. During the same period, a portion of an additional USD 1.6 trillion of credit risk has been transferred to primary mortgage insurers (FHFA, 2019). PMI companies also participate in the CRT market through the issuance of USD 10 billion of insurance-linked notes referencing over USD 1 trillion of insurance in force (USMI, 2021).

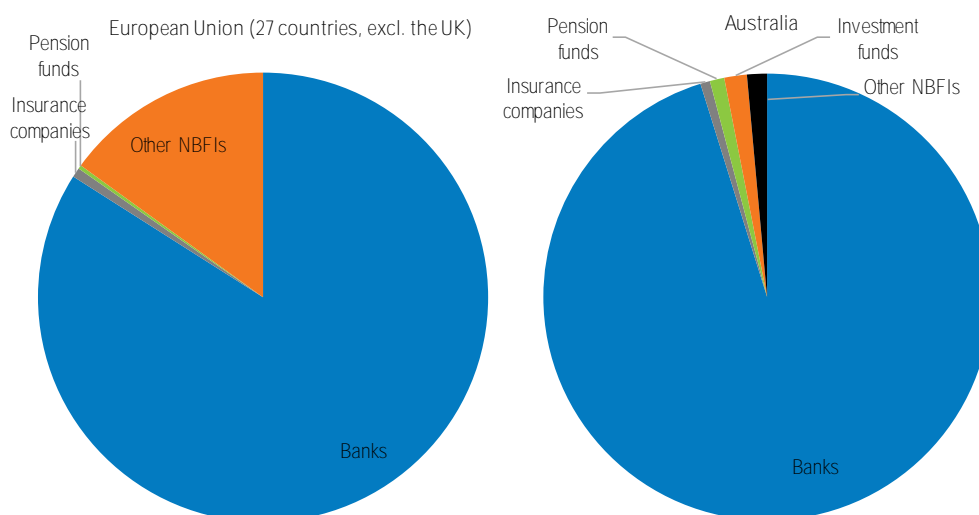
An adverse shock in the residential mortgage market may trigger financial stress through linkages with PMI and CRTs (SEC, 2020b).

- PMI companies are likely to face losses and subsequent rating downgrades depending on the severity of the increase in borrower's default and the magnitude of realised losses on foreclosure. Following the COVID-19 crisis, rating agencies have downgraded the credit ratings associated with PMI companies (S&P Global Ratings, 2020b).
- A potential source of risk relates to the somewhat concentrated ownership of CRTs and the uncertainty about the capabilities of CRT holders to bear the risk of a significant adverse shock in the residential mortgage market (SEC, 2020b). Notably, the nature of the funding of certain CRT investors' raises concerns. In some cases, investors finance their CRTs in the short-term secured funding market that is equivalent of using the indirectly levered CRTs to obtain more leverage. Rising losses following defaults from borrowers' defaults on CRTs or margin calls can potentially create a feedback loop of forced selling and deleveraging. Financial distress of some financial intermediaries exposed to CRTs may spill over to several other markets and intermediaries and potentially threatened financial resilience. Some investors exposed to CRT markets have been affected by the COVID-19 shock as they did receive margin calls that they were unable to meet. Subsequent actions of the Federal Reserve helped to alleviate pressures and stabilise markets (Urban Institute, 2020). In early March 2020, the CRT market shut down due to a bout of uncertainty and investors' fear that a serious loss event was imminent (FHFA, 2021). This shock has made costlier for Fannie Mae and Freddie Mac to transfer credit risk that have temporary held the risk on their own balance sheets. A complicating factor in understanding CRT issuance following COVID-19 outbreak in 2020 also relates to the issued notice by the FHFA in May 2020 of proposed rulemaking to establish a new capital rule for the Fannie Mae and Freddie Mac, which caused them to review their respective CRT strategies. Housing market rebound following unprecedented monetary and fiscal support measures in 2020 helped Freddie Mac to resume CRT issuance in July 2020, while issuance of Fannie Mae recovered with some delays since the first quarter 2021.³⁰ While CRT transactions have not been tested by a serious loss event since the programs' inception in 2013, some CRT investors suggested that their willingness to continue to invest in CRTs was contingent on Fannie Mae and Freddie Mac amending or suspending certain contractual provisions of early fixed-severity securities issuance CRTs (Bloomberg, 2020b).

³⁰ Fannie Mae has reported USD 2.23 trillion of total unpaid principal balance of mortgage loans that have been partially covered by single-family CRT vehicles at issuance as of first quarter 2021.

In assessing non-bank commercial mortgage lending, available data for major real estate finance markets show moderate non-bank lending that ranges from under 5% in Australia and is somewhat higher at 16% on average in the European Union (excluding the United Kingdom; Figures 26 and 27) at end-2020. Nevertheless, there is a high heterogeneity across European economies (i.e. Ireland, Belgium, Sweden, Latvia, Netherlands, Czech Republic, Malta, Italy) characterised by substantial financing shares from insurance companies (i.e. Germany, Belgium, Croatia), pension funds (i.e. Cyprus) and investment funds (i.e. Ireland, Belgium, Latvia, Czech Republic, Netherlands, Malta, Italy).

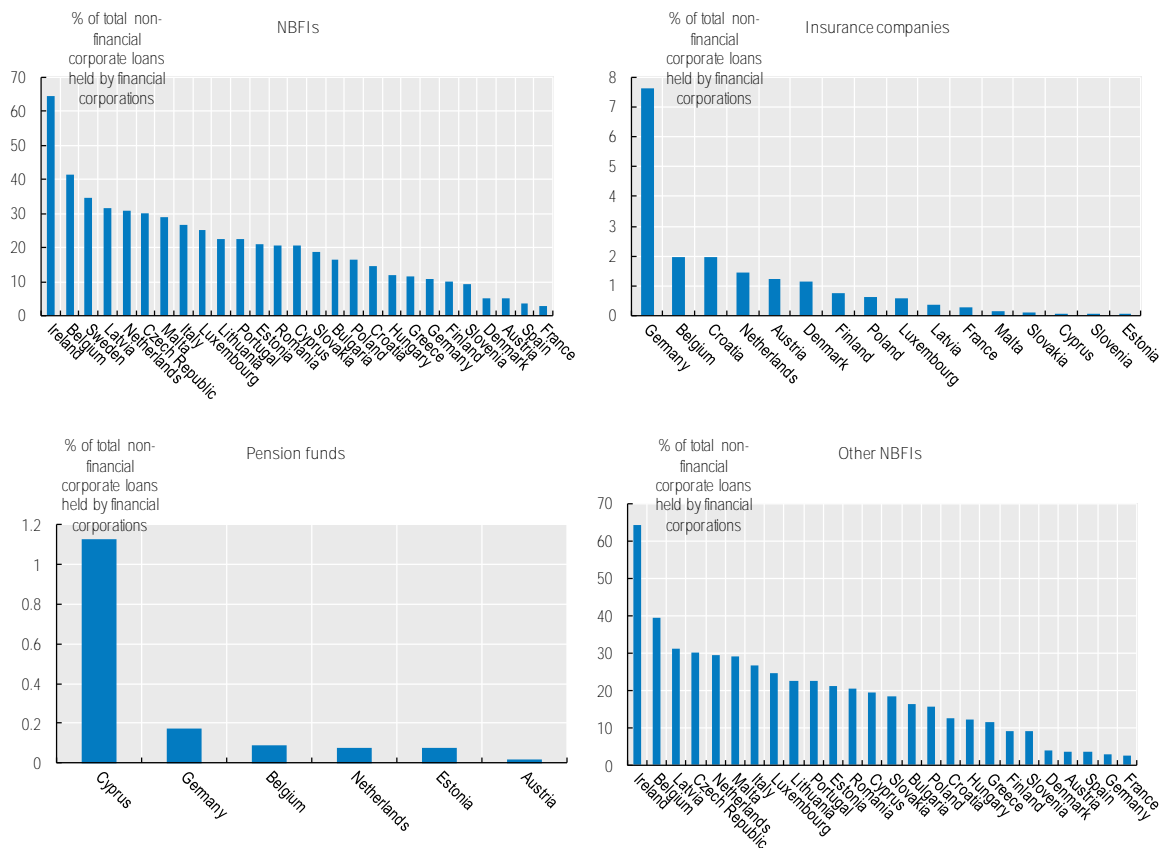
Figure 26. Commercial mortgages by type of lender in the European Union and Australia, 2020



Note: These figures show flow of fund data stocks for the non-financial corporate sector in the European Union (excluding the United Kingdom) and Australia. In the European Union (excluding the United Kingdom), other NBFIs refer to other financial institutions (i.e. financial corporations other than monetary financial institutions, insurance corporations, private pension funds and non-money market investment funds). In Australia, other NBFIs include central borrowing authorities, securitisers and other financial corporations.

Source: ECB, Australian Bureau of Statistics, OECD calculations.

Figure 27. Commercial mortgages by type of lender in selected European Union economies, 2020



Note: These figures show flow of fund data stocks for European Union economies excluding the United Kingdom. NBFIs include insurance companies, pensions funds and other NBFIs. Other NBFIs refer to other financial institutions (i.e. financial corporations other than monetary financial institutions, insurance corporations, private pension funds and non-money market investment funds). Countries with a null ratio are not shown.

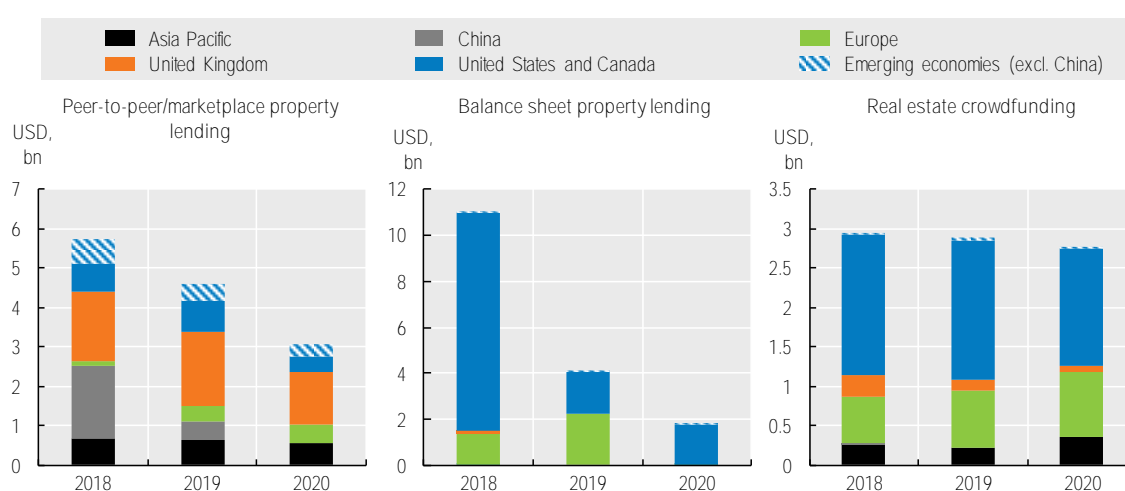
Source: ECB, OECD calculations.

Fintech lending has expanded in major real estate finance markets, which brings efficiency gains while raising potential concerns for financial resilience

The rise of non-bank mortgage lending in the United States has been coupled with a wave of technological innovation and the rising importance of fintech mortgage originators. According to Fuster et al. (2019), the main difference between US fintech lenders and traditional lenders is their use of the technology to fundamentally streamline and automate the mortgage origination process. Particular features of the business model of fintech lenders' consist of an end-to-end online mortgage application platform and centralised mortgage underwriting and processing augmented by automation. Empirical evidence shows that fintech mortgage lending has grown substantially over the last decade and dominated mortgage market originations for the first time in 2017, dethroning the largest US banks (i.e. such as Wells Fargo, JP Morgan Chase and Bank of American which were the major lenders historically) from the top of the ranking. Notably, Quicken Loans has originated about 16% of total mortgages originated by the top 25 lenders and fintech mortgage lending companies have originated 60% of total mortgages originated by the top 25 mortgage lenders that year. These trends have accentuated over the recent years as reflected by the share of total mortgages originated by the top 25 mortgage lenders that has risen to 67% in 2020. Also, Quicken Loans and United Shore Financial Services have together originated 30% (i.e. 17% and 11% respectively) of total mortgages originated by the top 25 lenders.

Alternative digital finance activities have also expanded in other major real estate finance markets (BIS, 2020b). and notably for real estate financing. The Cambridge Center of Alternative Finance (CCAF, 2020) has identified three types of alternative finance for real estate that include i) peer-to-peer/marketplace property lending,³¹ ii) balance sheet property lending³² and iii) real estate crowdfunding.³³ The United Kingdom and the European Union are the largest markets in addition to the United States (Figure 28). Nevertheless, peer-to-peer/marketplace property lending and balance sheet property lending markets have shrunk in absolute volume from 2019 to 2020. According to the CCAF 2021 survey,³⁴ the COVID-19 crisis has played a role with many respondents indicating that loan-origination was suspended or scaled back during the first half of 2020. Qualitative remarks, however, suggest that firms were beginning to recover in the latter half of 2020, and that 2021 has begun to rebound.

Figure 28. Alternative digital real estate finance by region, 2018-2020



Note: Emerging economies (excluding China) include economies located in Latin America and the Caribbean, in the Middle-East and North Africa and in Sub-Saharan Africa.

Source: Cambridge Center of Alternative Finance, OECD calculations.

Adoption of productivity enhancing technologies have the potential to increase efficiency from a substantial reduction in operating costs and the better accuracy of mortgage transactions that would help preventing fraud (BIS, 2017a). Processes provided by online platforms automate those that had been labour intensive, speeds up information transfer, and can improve accuracy, for example by eliminating transcription errors or by improving fraud detection systems. These technological innovations make the mortgage underwriting process more standardised and repeatable that allow platforms to operate with relatively low costs.³⁵ In

³¹ Individuals or institutional funders provide a loan, secured against a property, to a consumer or business borrower, commonly ascribed to off-balance sheet lending.

³² The platform entity provides a loan, secured against a property, directly to a consumer or business borrower, ascribed to on-balance sheet nonbank lending.

³³ Individuals or institutional funders provide equity or subordinated debt financing for real estate.

³⁴ The CCAF performs annual global benchmarking survey in more than 185 countries. 821 firms provided 2019 data, while 703 firms reported on their 2020 activity. These survey responses translate to 1,801 firm-level observations for 2019 and 1,660 firm-level observations for 2020, given firms that operate in multiple jurisdictions. For further information, please see Cambridge Center of Alternative Finance (2021).

³⁵ From a consumer stand point, Philippon (2015) and Buchak et al. (2018) have shown that advances in financial technology have failed to reduce intermediation costs and even fintech lenders offer higher interest rates than non-

addition, increased and better uses of data have the potential to reduce information asymmetries that could allow for the creation of smart contracts, characterised by more accurate targeting of specific borrower's needs and risks, with substantial benefits for risk management of fintech mortgage lenders.

While there are benefits, there may also be disadvantages, including a more automated approach to mortgage underwriting (World Bank, 2021). Fintech digital platforms are also vulnerable to external threats and risks of cyber-attacks that can expose consumers to higher risks of loss and other harm, including from third-party fraud. Also, fintech lenders increase access to riskier or complex financial products to consumers, who lack the knowledge or experience to assess or use them properly, that may lead to heightened risks of loss from fraud or misconduct by operators or related parties and of harm due to product unsuitability. To address these challenges, operators would have to implement outsourcing-specific risk management, strengthen their operational reliability systems and improve consumer disclosure and transparency in a digital context.

The emergence of several stand-alone fintech firms as major lenders over the last few years is a strong indicator that fundamental changes are underway. These firms are at the technological frontier as they are pioneers in using digital technologies through the entire mortgage origination process. In contrast, established lenders with branch-based mortgage origination processes face significant obstacles in recalibrating their operations away from branches and loan officers. That said, a significant and growing number of mortgage lenders are at present incorporating aspects of the fintech model and the current distinction between fintech originators and other firms, including banks, may be temporary. Also, banks and fintech companies are increasingly considering whether to collaborate in providing credit (BIS, 2020a). A widespread model consists of fintech lenders that provide the digital infrastructure to interact with the borrower while the bank originates the mortgage. While the bank leverages the fintech firm's client base, it may face potential risks from borrower's credit assessment performed by the fintech party. However, banks are subject to stringent solvency and liquidity regulations and fintech partners may be more vulnerable due to the unsustainability of their business models and their less stringent credit quality standards that could have negative effects on the banks collaborating with them.

3.2. Main risks associated with non-bank mortgage originators and servicers

This subsection describes the main risks faced by non-bank US mortgage originators and servicers due to their business models and also by insurance companies, pension and investment funds due to their real estate investments. It also discusses the implications of the COVID-19 crisis by focusing on the impact of loan forbearance measures and the significant downturn in the commercial real estate sector.

Non-bank US mortgage lenders are exposed to funding liquidity risk as a result of their business model

Non-bank mortgage lenders fund their business through some combination of retail notes, whole loan sales, securitisation, warehouse lines of credit, and firms' own balance sheets, i.e. supported by debt and equity investors.³⁶ The reliance of non-bank mortgage lenders on short-term warehouse lines of credit to fund long-term mortgages may expose them to liquidity mismatch. Non-bank mortgage lenders may face liquidity shortages following an unexpected shock leading to less liquid securitisation markets. In the event of a shock that negatively impacts the credit quality of mortgages and raises investor concerns over non-bank mortgage lenders, these institutions would likely experienced a reduced access to funding at a higher

fintech lenders. These results suggest that consumers' willingness to use more expensive fintech lenders may reflect more convenient services offered by these lenders.

³⁶ Non-bank mortgage lenders have a range of funding structures with a diverse set of investors such as banks, traditional asset managers, hedge funds, family offices and high net worth individuals. While some firms have publicly traded equity, most firms are still privately held. For further details, please see Banque de France (2018).

cost amid heightened risk aversion. Unlike banks, which can rely on deposits as a source of stable funding, non-bank mortgage lenders do not rely on a captive deposit base, so are subject to relatively sharp changes in the cost of funding that can call into question the viability of such a funding model. Kim et al. (2018) also argued that non-bank mortgage lenders will face difficulties in raising debt to fund additional expenses as most of their eligible assets are already pledged as collateral on secured lending facilities.

Procyclicality makes non-bank US mortgage lenders more vulnerable to unexpected shocks

Deterioration of borrowers' credit quality following an unexpected shock may lead to deferred payments which combined with lower mortgage originations and increased mortgage servicing costs may erode the income and subsequent profitability of non-bank mortgage lenders. Therefore, understanding the implications of mortgage payment deferrals, increased defaults and loan-loss provisions would be crucial to strengthen non-bank mortgage lenders' risk management strategies and resilience. Also, predicting long-term impact on margins due to high volatility in interest-rate spreads would help to mitigate the impact of prolonged decline in loan portfolio volume on revenues (Deloitte, 2020).

Non-bank US servicers are exposed to liquidity risk through MSRMs that may become particularly concerning amid rising mortgage forbearance

One notable shift since the GFC is the increase in mortgage servicing activities by non-bank US mortgage lenders that may be mainly attributed to large bank sales of GFC-era legacy servicing portfolios and the increase in mortgage origination activity among non-bank mortgage lenders (FDIC, 2019). In 2021, non-bank mortgage lenders service 60% of mortgages, up from 6% in 2011 (CSBS, 2019 and 2021). Non-bank mortgage lenders have expanded their mortgage servicing market share largely through bulk purchases of MSRMs³⁷ of non-performing loan portfolios originally held by banks. Also, more stringent capital requirements for MSRMs have been implemented in 2013 by the US federal banking agencies³⁸ consistently with the Basel III regulatory framework³⁹ to limit the holdings of MSRMs relative to bank equity that has contributed to deterred growth in banks' servicing portfolios. Nevertheless, such requirements do not apply to non-bank mortgage lenders. In July 2021, the Conference of State Bank Supervisors (CSBS) has approved "Proposed Regulatory Prudential Standards for Non-bank Mortgage Servicers" to strengthen the financial soundness of non-bank mortgage lenders and servicers and their ability to fulfil their significant requirements associated with servicing mortgage loans.⁴⁰

Non-bank US mortgage lenders are increasingly exposed to volatility through the rising share of MSRMs on their balance sheets due to potential losses and cash advance payments to the investor (Urban Institute,

³⁷ An MSR is created only when the act of servicing is contractually separated from the underlying loan. A firm, for example, that originates a mortgage, sells it to a third party, and retains the servicing would report an MSR on its balance-sheet. An MSR is an asset if the net present value of the cash flows exceeds the cost of the servicer's obligations to service the associated mortgage loans and a liability if the cash flows do not exceed the cost to service. The MSR valuation is adjusted on a periodic basis to recognise changes in fair value based on portfolio and market conditions.

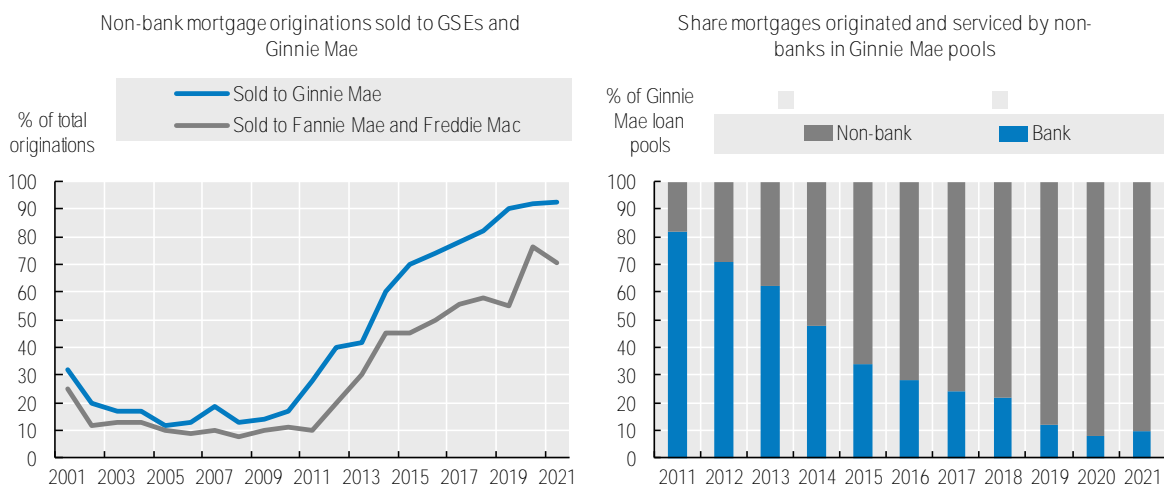
³⁸ Federal banking agencies include the Federal Deposit Insurance Corporation (FDIC), the Federal Reserve Board (FRB), the Office of the Comptroller of the Currency (OCC) and the National Credit Union Administration (NCUA),

³⁹ MSRMs are limited to 10% of a bank's common equity Tier 1 capital (CET1); any MSRMs in excess of 10% are deducted from common equity and if not deducted are subject to a 100% risk-weight that increases to 250% since 2018. In September 2017, the Basel Committee on Banking Supervision (BCBS) published a proposed new rule that would significantly loosen the restrictions on MSR holdings above that in the Basel III rule. This simplification has become effective since January 2020. Banks with under USD 250 billion in total assets are allowed to hold over twice the percentage of capital in the form of MSRMs as previously allowed under Basel III (25% of common equity tier 1 capital vs 10% for larger banks). For further details, please see BCBS (2011) and BCBS (2017).

⁴⁰ CSBS (2021). Further details about the regulatory environment of non-bank mortgage lenders and servicers will be provided when discussing some high level policy consideration in section 4.

2016). Such liquidity risk is compounded for non-bank US servicers by the fact that mortgage originations by non-bank mortgage lenders dominate and tend to be of lower credit quality than those originated by banks. In fact, when a mortgage defaults, the servicer not only loses servicing income but must also keep settling payments to investors, tax authorities, and insurers using its own funds, as well as incurs the notoriously high cost of servicing a now-delinquent mortgage.⁴¹ In particular, Ginnie Mae servicers are exposed to greater liquidity risk, as they are likely to face higher impaired or defaulted loan servicing (Ginnie Mae, 2016). The risk particularly prevails for non-bank servicers as they represent more than 90% of all originations sold to Ginnie Mae and the volume of mortgages in Ginnie Mae pools that were issued and serviced by non-bank mortgage lenders exceeds the corresponding volume for banks (Figure 29). Therefore, non-bank servicers would have to fill the liquidity gap and would be more exposed to residual losses. For loans in both GSEs (including Fannie Mae and Freddie Mac) and Ginnie Mae pools, the mortgage borrower takes the initial credit loss. Then, the private mortgage insurance company or the government entity that guarantees the loan are taking second round losses. However, Ginnie Mae servicers are expected to bear any credit losses that the government or the insurer does not cover while GSEs are taking the residual losses.

Figure 29. US mortgages originated by non-bank mortgage originators and sold to agencies, 2001-2021



Note: 2021 data are as of end of April.
 Source: GAO (2019) and Ginnie Mae (2021a).

Liquidity pressures for non-bank US mortgage servicers may also arise due to their funding model and use of MSRs as collateral to fund leverage

Real estate mortgage markets are procyclical, whereby significant adverse shifts in perceived economic conditions and expected delinquencies may result in a withdrawal of liquidity from warehouse lenders leading to substantial liquidity pressures for non-bank US servicers given their lack of access to retail deposits or liquidity facilities from the central bank. Also, the fact that mortgage servicers often pledge MSRs as collateral to fund their leverage increases risk of financial distress following an episode of stress in the mortgage market due to the decline in the value of MSRs that triggers margin calls. In 2021, Ginnie Mae has issued a “request for input” on imposing a risk-based capital requirement on non-bank issuers and an increase in the net worth and liquidity requirements for all issuers (Ginnie Mae, 2021b). The aim is

⁴¹ In particular when continuing servicing loans that are under foreclosure or forbearance.

to extend of regulatory requirements for banks to non-bank issuers to strengthen the financial resilience of non-bank servicers and mitigate risks from their MSR exposures. Ginnie Mae already announced that most issuers will be able to meet these requirements by year-end 2021. Nevertheless, Ginnie Mae will consider proposals for extending the period to come into compliance with the requirements for the small number of issuers that will not be able to meet such requirements.

A collapse of non-bank US mortgage lenders and servicers could amplify negative shocks but regulators have recognised risk posed and strengthened regulatory oversight

As shown by the GFC and the COVID-19 crisis, financial distress of non-bank mortgage lenders may pose a substantial threat to financial system resilience, both directly and through its interconnectedness with the regular banking system. Short-term deposit-like funding of non-bank entities could lead to “runs” in the market if confidence is lost. Also, the use of non-deposit sources of secured funding can also facilitate high leverage, especially when asset prices are buoyant and collateral margins on secured financing are low. Moreover, risks of non-bank mortgage lenders may transmit to the regular banking system through warehouse lines of credit. These risks are amplified as the chain becomes longer and less transparent. A substantial increase in defaults of non-bank mortgage lenders is likely to trigger a significant contraction in mortgage origination capacity as it is not clear if other financial intermediaries would extend credit. This drop in mortgage credit availability may have substantial negative spillover effect on real estate prices (Anenberg et al., 2017). In addition to these micro-financial and macro-financial risks inherent to non-bank mortgage lenders, specific cyber-attack risks to Fintech lending are increasing.⁴²

Regulators have recognised risk posed by NBFIs and have moved to strengthen regulation and oversight. Since the GFC, policies have been introduced at the international level, and both regulatory reforms and new policy tools have been introduced at national or regional levels to address financial stability risks from the non-bank financial sector (FSB, 2017a). Notably, authorities have taken steps to address banks’ involvement in market-based finance and acted to reduce liquidity and maturity mismatches, and also leverage in the non-bank financial sector. Alongside increases in capitalisation of banks’ securitisation related exposures, national and regional reforms have been undertaken to address incentive problems and opaqueness associated with securitisation. It is worth noting that while non-bank US mortgage lenders and servicers have less access to liquidity than banks, they do not pose the risk of a claim on the deposit insurance fund.

Non-bank US mortgage lenders and servicers have faced moderate stress following the COVID-19 crisis, yet delinquencies could be expected to rise following withdrawals of policy support measures

Unprecedented monetary and fiscal support measures have helped contain mortgage defaults in aggregate that may have mitigated the COVID-19 induced financial strain on non-bank US mortgage originators and servicers as well as their funding sources. Notably, the Federal Reserve’s monetary stimulus has supported MBS market conditions that contributed to lower interest rates, which made mortgages more affordable. Also, the CARES Act unemployment assistance and mortgage forbearance likely reduced the incidence of delinquencies and foreclosures (GAO, 2021). Nevertheless, mortgage servicers have been particularly concerned by the impact of mortgage forbearance on their solvency following the COVID-19 crisis (SEC, 2020b). Some of the federal housing agencies have taken steps to address potential liquidity issues. The FHFA and Ginnie Mae have announced a number of measures to facilitate liquidity by making it easier for mortgage lenders and servicers to receive various forms of short-

⁴² According to PWC (2017), the susceptibility of financial activity to cyber-attacks is likely to be higher the more the systems of different institutions are connected, amongst which there is a weak link. In general, greater use of technology and digital solutions expand the range and number of entry points cyber hackers might target. However, depending on how fintech services develop, a larger number of financial service providers could also help to increase competition and diversity in the financial system and make any single cyber-attack less systemically relevant.

term cash advances.⁴³ Nevertheless, the emergence of new variants combined with the uneven recovery across sectors could have detrimental implications for the asset quality of non-bank originators and servicers in the absence of continuous targeted income support for households and firms that operate in the most vulnerable sectors.

Insurance companies and investment funds in several European jurisdictions are exposed to solvency or redemption risks from their commercial real estate investments while pension funds face moderate exposure to the real estate sector

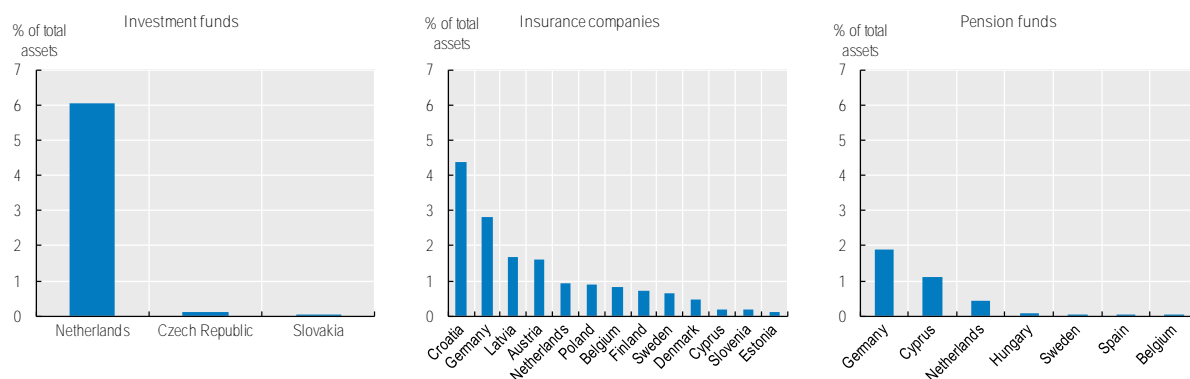
The low interest rate environment in the aftermath of the GFC and the flattening of the yield curve have increased the interest of insurance companies, pension and investment funds in real estate investments including direct loans or investments in REITs and REMFs. As documented in section 3.1, insurance companies, investment and pension funds account for substantial shares of non-bank real estate financing in certain European jurisdictions. Nevertheless, investment funds and insurance companies tend to have higher loan exposures than pension funds (Figure 30). While pension funds have moderate exposures to both residential and commercial mortgage loans, insurance companies tend to be more exposed to residential mortgage loans than real estate commercial loans, except in the Netherlands, Belgium, Germany and Bulgaria where commercial real estate loans account for a substantial share of the total assets of insurance companies. In addition, investment funds tends to be more exposed to commercial real estate loans than residential mortgage loans, especially in Estonia, Czech Republic, Latvia, Portugal, Slovenia and Lithuania.

A drop in commercial real estate prices is likely to trigger share redemptions for open-ended investment funds and could erode the solvency ratio of insurance companies exposed to these markets. Valuation losses from commercial real estate exposures could make affected insurance companies and investment funds less willing or able to provide new financing in several European jurisdictions (IMF, 2021). Empirical analysis shows that a 10% decline in the value of commercial real estate holdings could wipe out as much as 4% of aggregate insurance excess of assets over liabilities in the European Union (ECB, 2020b). Also, the greenification of office and business space may induce further challenges due to the shift in demand for commercial real estate and its negative impact on prices. More broadly, the relatively small direct exposure to the real estate sector of pension funds and insurance companies in most jurisdictions and the fact that indirect investments in real estate are often internationally diversified combined with adequate risk management help to mitigate risks of financial distress (DNB, 2018).

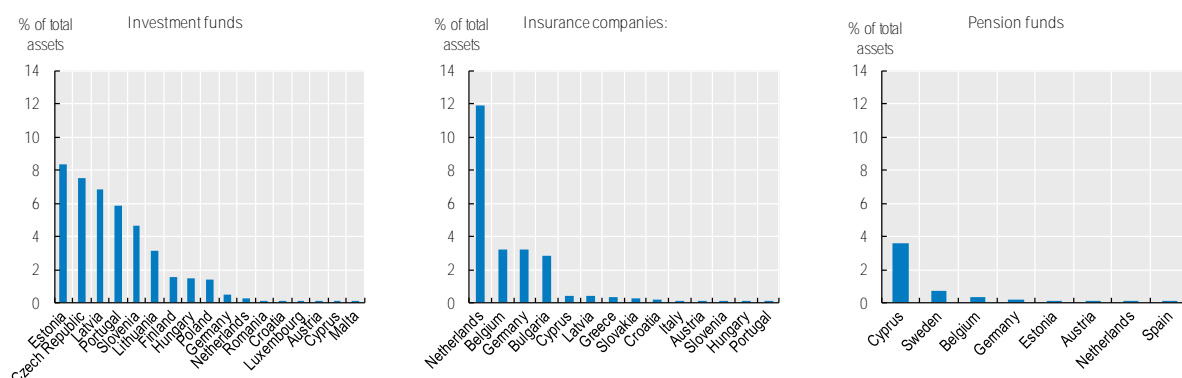
⁴³ The FHFA announced on April 21, 2020, that Freddie Mac and Fannie Mae would limit the obligation of mortgage servicers to advance payments to the GSEs for loans that are in forbearance to four months of payments, allowing servicers to forgo remitting payments after that time frame. On March 27, 2020, Ginnie Mae announced a last resort financing option, the Pass-Through Assistance Program, to allow servicers facing shortfalls to request a cash advance to meet the scheduled payments to investors. For further details, please see FHFA (2020) and Ginnie Mae (2020).

Figure 30. Real estate loans in total assets of insurance companies and pension funds in selected European Union economies, 2020

Loans to households



Loans to non-financial corporations



Note: These figures show flow of fund data stocks for European Union economies excluding the United Kingdom. Countries with a null ratio are not shown.

Source: ECB, OECD calculations.

Given the size, complexity and diversity of entities in the global NBFi sector, a comprehensive risk monitoring framework would help policymakers better identify key risks and vulnerabilities

While market-based financing brings benefits, like all forms of financial intermediation, it may also contribute to a build-up of financial vulnerabilities. The global financial system has entered the COVID-19 crisis more resilient and better placed to sustain financing to the real economy as a result of regulatory reforms in the aftermath of the GFC. However, the market turmoil in March 2020 has reinforced the need to better understand the nature of liquidity risks in the financial system and vulnerabilities in the NBFi sector (FSB, 2020a). To be able to identify the main threats to the financial resilience of this part of the financial sector, a sound risk monitoring framework would facilitate a comprehensive and systematic assessment of the main vulnerabilities. The main purpose is to identify excessive risk-taking behaviour of diverse types of real estate NBFIs (including independent lending companies, insurance companies, pension funds, mREITs and REMFs) to prevent price bubble build-up in some credit market segments. Consistently with the OECD Policy Framework for Effective and Efficient Financial Regulation, a sound assessment of risks and vulnerabilities is crucial to identify the major problems and establish the case for intervention to issue relevant policy recommendations. Following the March 2020 market turmoil, the Financial Stability Board (FSB) has suggested, among other priority areas and new initiatives, to enhance the resilience of the NBFi

sector and find an appropriate balance between costs and benefits (FSB, 2021a). From the risks outlined in the previous sections for the several NBFIs exposed directly or indirectly to the real estate sector, two key sources of financial vulnerabilities appear: excessive leverage and excessive liquidity transformation. Nevertheless, such vulnerabilities are also compounded by the several following sources of risks:

- ***The level of tangible real estate or financial real estate asset prices*** may have implications for real estate NBFIs' exposure to both accrual and marked-to-market losses and price volatility that may have detrimental effects due to their incomplete hedging, their inability to levy capital and the decline in the value of collateral with potential substantial margins calls and subsequent liquidity shortages.
- ***The quality of real estate financial assets and underlying mortgages*** may have implications for real estate NBFIs' exposure to riskier segments with potential risks that may arise from concentration, poor lending standards and weak financial soundness of market participants.
- ***The reliance of wholesale market funding and weak liquidity profile*** of certain real estate NBFIs expose them to liquidity mismatch and subsequent financing or redemption risks with potential spillovers to short-term secured funding and MBS markets.
- ***Levels of leverage and indebtedness*** could amplify the negative consequences of a shock for certain stakeholders that emphasises a necessity to strengthen their capitalisation and risk management framework due to complex business models (i.e. synthetic leverage).
- ***Domestic and cross-border interconnections*** may lead to rising fragility from common, large and/or foreign currency exposures.

4 High-level policy considerations

Large real estate price declines can adversely affect macroeconomic performance and financial resilience, as seen throughout the GFC and the COVID-19 crisis. These macro-financial links arise from the diverse role real estate plays for households, businesses, and financial intermediaries, as a consumption good, long-term investment, store of wealth, and collateral for lending, among others. In this context, the rapid increase in real estate prices in many countries in recent years combined with the high level of indebtedness of households and corporates in certain jurisdictions and rising leverage of financial intermediaries have raised concerns about the possibility of a decline and its potential consequences.

This section details the macroprudential policies that have been applied to banks in many jurisdictions since the GFC to strengthen their resilience against real estate exposures and to contain the procyclical build-up of vulnerabilities. In addition, further consideration should be given to the use of activities-based measures to help mitigate procyclicality and excessive liquidity transformation for mREITs and REMFs. Lastly, the section discusses the regulatory environment for non-bank mortgage lenders and servicers aimed at strengthening resilience in the sector.⁴⁴

4.1. Macroprudential tools targeted to banks

Mortgage credit exuberance could lead to a substantial increase in real estate prices, as seen in several past economic cycles, and increase the risk of a real estate crisis. Since the GFC, the implementation of the Basel III accords and introduction of the IFRS 9 accounting standards have provided some additional cyclical tools to increase the resilience of banks against their real estate exposures and mitigate procyclicality. These include several tools among i) broad-based capital tools, ii) sectoral capital tools, and iii) liquidity-related tools (IMF, FSB and BIS, 2016); and ECB, 2015).

Broad-based capital tools have a direct impact on banks' resilience against borrower defaults, and may also help in preventing excessive mortgage credit growth to support the supply of credit through adverse conditions. These include: i) dynamic provisioning requirements, ii) countercyclical capital buffer (CcyB), and iii) macroprudential supervisory stress tests.

Dynamic provisioning allows banks to build-up countercyclical provision buffers to mitigate pro-cyclicality

The adoption in 2000 of countercyclical (or dynamic) provisions by the Bank of Spain is a relevant example (Saurina and Trucharte, 2017). The aim was to shield banks' capital positions and, therefore, lending capacity, from sudden and sometimes material changes in loan loss provisioning required under the incurred loss (IL) accounting standards. In this sense, dynamic loan loss provisions mean that reserves for loan losses on a bank's balance sheet grow significantly during a phase of economic expansion, a time associated with substantial credit growth and rising real estate prices but limited credit impairments and default events than during an economic downturn. Therefore, such countercyclical measures can contribute to more moderate mortgage lending growth, depending on the ability of the bank to strengthen its loan loss absorption buffer. In practice, the Bank of Spain did so by moderating the cyclical fluctuation

⁴⁴ Policies aimed at mitigating vulnerabilities of insurance companies and pensions funds from their direct real estate lending exposures are not covered in this report as they are the focus of several other OECD forums.

of provisions set under the IL model and tying provisions directly to the level of credit activity and state of the credit cycle. Borio and Lowe (2001) outlined that the scheme did not account explicitly for loan pricing, which should already incorporate an expected-loss element, and suffered from some inevitable arbitrariness in the selection of benchmarks for the size of the provisions.⁴⁵ Nevertheless, the authors acknowledged that the scheme had the great merit of being truly countercyclical, of being simple and, in particular, of having an automatic release mechanism (BIS, 2018). Following the GFC, the concept of expected credit losses (ECLs) has been considered by several accounting standard-setting bodies as a potential solution to delayed loss recognition and improve dynamic provisioning of banks.⁴⁶

The countercyclical capital buffer aims to protect the banking sector from periods of excess aggregate credit growth that have often been associated with the build-up of system-wide risk

The GFC demonstrated that losses incurred in the banking sector during a downturn preceded by a period of excess real estate credit growth can be extremely large. Such losses have the potential to destabilise the banking sector, which can bring about or exacerbate a downturn in the real economy. This in turn can further destabilise the banking sector. These interlinkages highlight the particular importance of the banking sector building up its capital defences in periods when mortgage credit has grown to excessive levels. The building up of these defences should have the additional benefit of helping to moderate excess mortgage lending growth and a substantial increase in real estate prices. In December 2010, the Basel Committee on Banking Supervision (BCBS) published the Basel III global regulatory framework (BIS, 2010) that introduced the concept of a countercyclical capital buffer (CCyB). The CCyB aims to ensure that banking sector capital requirements take account of the macro-financial environment, including developments in the real estate sector, in which banks operate. The countercyclical nature of the CCyB may help to lean against the build-up phase of the credit cycle in the first place. Conversely during downturns, CCyB should help to reduce the risk that the supply of credit will be constrained by regulatory capital requirements that could undermine the performance of real sectors and result in additional credit losses in the banking system.

Supervisory stress tests have accounted for banks reactions to macroeconomic and financial developments, yet mREITs and REMFs would require a deeper understanding of potential contagion effects and feedback loops for the resilience of the banking system

Since the GFC, the role of stress testing as a supervisory tool has risen to prominence in many jurisdictions and authorities use stress tests to meet both micro and macroprudential objectives targeted to the banking sector (BIS, 2017b). For instance, supervisory stress tests assess a bank's ability to withstand adverse shocks and are generally accompanied by requirements intended to boost the capital of banks that are found to be at risk. Nevertheless, stress testing exercises are likely to impact banks' risk-taking behaviour and supply of credit. Acharya, Berger, and Roman (2018) find that all banks that underwent the US Supervisory Capital Assessment Program (SCAP) and Comprehensive Capital Analysis and Review (CCAR) reduced their risk by raising loan spreads and decreasing their commercial real estate credit and

⁴⁵ Other empirical evidences suggest mix results about the effectiveness of such prudential measures with some unintended side effects. Jiménez et al. (2017) find that dynamic provisioning smooths credit supply cycles and, in bad times, supports firm performance, while Carbo-Valverde and Rodríguez-Fernández (2018) find evidence suggesting that banks gamed dynamic provisions by adopting riskier ex ante behaviour.

⁴⁶ In July 2014, the International Accounting Standards Board (IASB) issued the final version of the IFRS 9 standard that provides requirements for the recognition of ECLs on a wide range of financial instruments, which became effective on 1 January 2018 (BIS, 2017c). In June 2016, the Financial Accounting Standards Board (FASB) introduced an ECL approach under the current expected credit losses (CECL) methodology in June 2016 (US GAAP Accounting Standards Codification (ASC) Topic 326). Nevertheless, the COVID-19 has resulted in some delays for the adoption of ECL standards mainly due to the difficulty of setting credit risk parameters during an economic downturn without precedent in severity in modern times.

credit card loan activity. Implications of supervisory stress tests for consumer and real estate lending growth are elements of the macroprudential role of stress tests.

Understanding the reaction of the whole financial system to an adverse macrofinancial shock scenario has become crucial for policymakers and financial market participants given the material growth of the non-bank financial sector in recent years and potential risks from this part of the financial system (Banque de France, 2021). As shown throughout the GFC, a substantial deterioration of the credit quality of MBS and financial distress of non-bank mortgage lenders may be a substantial threat for the resilience of the banking sector, both directly and through its interconnectedness with mREITs, REMFs and other financial intermediaries exposed to these products. Currently, there are only a few documented system-wide stress test models with different types of agents and risks rising in both various real sectors, including the real estate sector, and several parts of the financial sector. However, a growing body of literature studies the interconnections between the different channels and layers of financial markets, with a strong case being made for the joint integration of stress tests. Many central banks are currently developing system-wide stress test models. Results of these stress tests could indicate the magnitude of contagion effects due to interconnectedness following a shock and provide an assessment the financial resilience of the banking system. In this regard, the Federal Reserve (2021a) and the ECB (EBA, 2021) use different scenarios and consider forecasts for the evolution of commercial and residential real estate prices in addition to other relevant variables (i.e. real gross domestic product (GDP), inflation, unemployment rates, stock prices, exchange rates, interest rates).

Among **sectoral capital tools** that are aimed at addressing vulnerabilities associated with specific sectors (notably the real estate sector) and asset markets, sectoral capital-based requirements have been implemented in many jurisdictions to address emerging risks in the real estate sector.

Sectoral capital requirements increase banks' loss absorption capacity, lower potential losses and shift lending away from the real estate sector

Sectoral capital-based requirements have been implemented in many jurisdictions to allow relevant authorities applying higher risk weights or loss given default floors for retail exposures secured by residential or commercial real estate assets (ECB, 2021c). Furthermore, a number of national authorities have added borrower-based instruments linked either to the underlying collateral (e.g. loan-to-value limits) or to household income (e.g. loan-to-income, debt-to-income and debt service-to-income limits) to their macroprudential frameworks.

The Basel III reforms has suggested the implementation of a sectoral countercyclical capital buffer (SCCyB) to complement the CCyB with a more targeted measure (BIS, 2019a; and OECD, 2021b). This approach will help harmonising regulatory standards across jurisdictions and increase flexibility. For example, if the commercial real estate segment faces considerably higher imbalances than in the residential real estate segment, authorities may want to activate one SCCyB instead of activating either a single SCCyB on a broader segment category (i.e. targeting the overall real estate sector) or the broad-based Basel III CCyB. Nevertheless, the activation of several SCCyB across different credit segments rather than for two sub-segments may require national authorities to consider possible spillovers to other credit segments.

Among **liquidity-related tools** that are intended to address the build-up of liquidity and foreign-exchange risks associated with lending booms, reserve requirements may be used as macroprudential regulation tools.

Reserve requirements may be used as macroprudential regulation tools to prevent excessive mortgage credit growth and increased vulnerabilities in the real estate sector

Most central banks require deposit taking institutions to hold minimum reserves against their liabilities. Reserve requirements have a variety of functions, from a purely monetary policy instrument to a diverse

set of uses including financial stability motivations.⁴⁷ From a macroprudential standpoint, reserve requirements can be used as a tool to prevent excessive credit growth and vulnerabilities to increase in certain sectors, such as residential and commercial real estate sectors. In fact, reserve requirements may help to avoid capital inflows that might fuel credit booms. Compared to central bank policy rate adjustments, raising reserve requirements is less likely to attract capital inflows if they incentivise banks to raise lending rates without raising deposit rates (Montoro and Moreno, 2013). Also, higher reserve requirements on liabilities to non-residents than liabilities to residents is effectively a marginal tax on foreign liabilities and serves the goal of discouraging capital inflows to prevent overheating of some credit market segments, including real estate loans.

Macroprudential, microprudential, and regulatory tools implemented following the GFC have strengthened the resilience of the banking sector but strived to contain credit exuberance and mitigate financial risks at leveraged real estate NBFIs

There is a developing consensus that macroprudential measures have been generally successful in increasing the financial system's resilience and contain bank housing credit growth (Yilla and Liang, 2020; and OECD, 2021b). In particular, capital and liquidity requirements intend to increase buffers available to absorb losses during periods of higher illiquidity, and results of many studies indicate these tools have reduced banks' risks and strengthened financial system resilience. Also, other studies have found evidence indicating that macroprudential measures are effective to moderate bank credit growth and mitigate the risk of economy-wide crisis. Notably, the comprehensive study by Akinci and Olmstead-Rumsey (2015) evaluated the effectiveness of a number of different measures in 57 countries during 2000 to 2013 based on their impact on bank credit growth, house credit growth, and house prices. The results suggest that macroprudential policies could significantly reduce growth in bank credit, housing credit and house prices. A similar study by Cournède et al. (2019) covering 34 mostly OECD countries, yielded comparable results while in addition finding that macroprudential policies reduce the risk of economy-wide crisis. In addition, targeted policies aimed specifically at housing, like LTVs and DSTIs, are more effective than general policies, such as higher general capital requirements (Olmstead-Rumsney, 2015), whilst tighter capital requirements for riskier mortgage loans reduce crisis risk and pave the way for stronger recoveries (Cournède et al., 2019).

There are far fewer tools to address risks from elevated corporate debt and business models of some real estate NBFIs. Also, many investment funds, insurance companies and pension funds are subject to relatively weak liquidity requirements as they are typically designed from a microprudential perspective. The fact that real estate NBFIs are involved in certain activities or products with greater potential to pose systemic risk may lead to potentially dangerous interconnections in the system. The idea is not to label specific products or activities as intrinsically systemic. Instead, the focus is on the need for further exploration of the use of activities-based measures that are risk-based and flexible to help address growing risks for leveraged real estate NBFIs that perform liquidity transformation. These measures, while directed at activities or entities, collectively could make some segments of market-based finance more resilient to mitigate excesses and procyclicality (Patalano and Roulet, 2020).

⁴⁷ Also, their form may consist of a single uniform reserve requirements ratios on deposits or of differentiated ratios by currency, maturity, residency and type of liability (OECD, 2018).

4.2. Further steps toward developing activities-based tools to mREITs and REMFs

Considerable efforts have been made to address liquidity risks for OEFs while mREITs remain subject to market discipline for risk management

mREITs and open-ended REMFs, which are using short-term secured market funding and leverage, can be vulnerable to “runs” due to liquidity and/or maturity transformation, which in turn can generate contagion risk.⁴⁸ Risk management practices of REITs are generally subject only to market discipline in most jurisdictions (SEC, 2020b; and EPRA, 2020). Nevertheless, as with all public companies, market regulators require public REITs to disclose their liquidity, capital resources, and results of operations. As documented by an OECD report released in 2020,⁴⁹ considerable efforts have been made by the FSB to articulate key structural vulnerabilities from OEFs, and detailed recommendations have been developed by IOSCO. Notably, following the 2017 FSB Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities, IOSCO and its members issued two reports in 2018: 1) Recommendations for Liquidity Risk Management for Collective Investment Schemes; and 2) OEF Liquidity and Risk Management: Good Practices and Issues for Consideration (Good Practices). The array of tools to address liquidity transformation at OEFs includes i) the definition of appropriate liquidity thresholds which are proportionate to the redemption obligations; ii) a careful determination of a suitable dealing frequency for the units to ensure that collective investment scheme dealing (i.e. subscription and redemption) arrangements are appropriate for a fund investment strategy and underlying assets; iii) the implementation of an effective liquidity risk management process to regularly assess the liquidity of the assets held in the portfolio and identify an emerging liquidity shortage before it occurs (including liquidity assessments in different scenarios such as fund level stress testing⁵⁰). The main purpose is to prevent OEF liquidity and redemption mismatches in normal and stressed market conditions so that OEF liquidity is properly managed, liquidity management tools are deployed appropriately, and investors are protected and treated equitably – all of which help to support fair and efficient market functioning, avoid systemic risk, and ultimately support financial stability.

Further investigations would be needed to define additional activities-based tools that could incentivise mREITs and REMFs to take heed of liquidity transformation risks

In March 2021, the FSB and IOSCO jointly conducted analysis on the availability, use and impact of liquidity risk management tools for OEFs.⁵¹ Of particular concern are the features in regulatory frameworks that could give rise to procyclicality. Whether a first-mover advantage in certain OEFs that engage in liquidity transformation could have motivated investor redemptions, how effectively OEFs’ liquidity management tools mitigate redemption pressures, and whether redemptions and asset sales exceed those to be expected on the basis of risk/return characteristics of underlying assets need to be investigated further (FSB, 2021b). Also, IOSCO launched a thematic review of the recommendations for liquidity risk

⁴⁸ These features can heighten procyclicality by accelerating credit supply increases during surges in confidence, but cause a precipitate fall in credit supply upon a loss of confidence. Moreover, the risks in mREIT and REMF sectors can easily spill over into the regular banking system and become amplified as credit is funded and intermediated through a less transparent chain of entities. For further details, please see FSB (2017b).

⁴⁹ Patalano and Roulet (2020).

⁵⁰ In 2019, ESMA has published guidance regarding liquidity stress tests conducted by investment fund managers in the EU. Notably, managers of investment funds need to regularly test the resilience of their funds to different types of risk, including liquidity risk. For further details, please see ESMA (2019).

⁵¹ In November 2021, the FSB has published a progress report titled “Enhancing the resilience of non-bank financial intermediation” (FSB, 2021d). This report describes progress in 2020 and 2021 and planned work by the FSB, as well as by standard-setting bodies and other international organisations, to enhance the resilience of NBFIs.

management for collective investment schemes issued in 2018 (IOSCO, 2021). The recommendations are meant to address structural vulnerabilities from liquidity and leverage in asset management activities. A Thematic Review report is expected for Autumn 2022. Most of the liquidity management challenges for REMFs are concentrated in funds structured to deliver daily dealing and fast settlement to shareholders yet offering exposure to assets with low structural and highly procyclical market liquidity. This implies that despite floating net assets value (NAV), strategic complementarities generating first-mover incentives for exit remain prominent for REMFs investors to mitigate funds' vulnerabilities to massive outflows as was the case in March 2020.

Beyond policies mitigating poor coordination redemptions, the significant liquidity mismatch given underlying asset market frictions suggests the need and desirability of expanding liquidity management tools for REMFs to absorb fundamentals and uncertainty-driven outflows, besides the option of redemption suspensions (IMF, 2021b). In October 2021, the FSB has published a report including policy proposals to enhance money market fund (MMF) resilience, including with respect to the appropriate structure of the sector and of underlying short-term funding markets (FSB, 2021c). Like REMFs, MMFs perform liquidity transformation and are prone to share redemptions. Therefore, among the key policy proposals by the FSB for MMFs, some measures could also be relevant for REMFs, including:

- **Swing pricing**⁵² could help mitigate redemption risk and first-mover advantages arising from mutualised liquidity, if it is implemented in a manner that is likely to pass on to redeeming investors the costs they impose on the fund. In addition, minimum balance at risk could reduce the first mover advantage from potential losses in a REMF because investors remaining in the fund would no longer bear losses disproportionately.
- **A capital buffer** of sufficient size would mitigate the risk of losses being assumed by investors, and thus reduce their incentives to run to redeem shares because of fears of potential losses in the fund. Imposing criteria for eligible assets would mitigate the impact of large redemptions by reducing the liquidity transformation performed by REMFs. REMFs would have to invest a higher portion of their assets in shorter dated and/or more liquid instruments, making them less dependent on liquidity conditions in the markets for the assets they hold, and reducing the first-mover advantage for redeeming investors.
- **Additional liquidity requirements and the use of liquidity management tools** could make REMFs more liquid on the asset side and provide funds flexible risk management solutions. While these policy measures could be beneficial to strengthen the resilience of REMFs, further considerations should be given to the prioritisation and combination of policy measures into a reform package to address identified REMF vulnerabilities by jurisdictions.

For mREITs, liquidity management challenges are related to maturity mismatch and debt rollover risk, which are resulting from the use of short-term secured funding and/or bank warehouse credit lines to finance longer-term MBS and mortgages. Notably, risk management tools aimed at strengthening the ability of mREITs to absorb losses and strengthen their liquidity positions would help to mitigate their sensitiveness to margin calls.

To better align with the OECD Policy Framework for Effective and Efficient Financial Regulation, authorities may consider greater emphasis on Principle 1B – Transparency of the Financial Landscape, to more consistently communicate concerns over potential vulnerabilities on the risk-taking behaviour of NBFIs along with the liquidity conditions in key financial market segments, so that stakeholders are able to incorporate assessments of growing fragilities into their risk assessment frameworks. In this sense,

⁵² Swing pricing is a mechanism that allows fund managers to reduce the fund's net asset value (NAV) when outflows exceed a "swing threshold". Fund managers would be able to allocate transaction costs in the best interest of all investors and achieve a more equitable treatment because transaction costs are borne by investors selling the shares rather than those remaining in the fund.

authorities should determine whether they have sufficient activities-based tools that incentivise NBFIs, including mREITs and REMFs, to take heed of liquidity transformation risks. To this end, market regulators may wish to engage in communication and discussions with diverse types of NBFIs over market conditions, and assess how their own risk management practices are developing in light of periods of elevated risk of market fragility. Given that there are costs and competitive dynamics related to portfolio composition choices to account for systemic liquidity risks, further guidance by securities regulators could help determine good practices for how liquidity tools could be utilised in a dynamic manner that incorporates both micro risks of NBFIs and macro risks associated with the broader liquidity conditions in global markets.

4.3. The regulatory framework applied to non-bank mortgage lenders and servicers

Non-bank US mortgage lenders and servicers are regulated for safety-and-soundness purposes and are subject to capital and liquidity requirements

The sharp rise in non-bank involvement in real estate mortgage lending and servicing has important implications for safety-and-soundness oversight in US mortgage markets. While non-bank mortgage lenders and servicers do not pose the risk of a claim on the deposit insurance fund, financial distress of non-bank mortgage lenders and servicers may be a substantial threat for financial system resilience, both directly and through its interconnectedness with the regular banking system. Therefore, non-bank mortgage lenders and servicers are regulated for safety-and-soundness purposes. Following the GFC, the Conference of State Bank Supervisors (CSBS) and the American Association of Residential Mortgage Regulators have developed safety-and-soundness examination procedures (CSBS, 2019). Some or all of these recommendations have been adopted by most states. In July 2021, the CSBS has approved “Proposed Regulatory Prudential Standards for Nonbank Mortgage Servicers” that would provide harmonised regulatory requirements for non-bank mortgage servicers for adoption by individual states.⁵³ These prudential standards aim at strengthening the financial soundness of non-bank mortgage lenders and their ability to fulfil their significant requirements associated with servicing mortgage loans and assisting customers with these important financial obligations. For instance, much of the foreclosure problem that occurred during the GFC was due to servicers insufficiently staffed and poorly managed at a time when borrowers needed help the most. Therefore, safety and soundness is fundamental to consumer protection and the financial condition and corporate governance requirements in these standards form the basis for safe and sound operations.

The Final Model Standards cover two major categories that comprise prudential standards for financial condition and corporate governance. The states may choose to align their financial condition standards with the capital and liquidity requirements imposed by the FHFA for non-bank servicers seeking to participate in GSE servicing programs. While the capital and liquidity calculations are the same, the Final Model Standards apply the FHFA requirements to all loans serviced by non-bank mortgage lenders and servicers, not just GSE servicing.⁵⁴ In addition, the Final Model Standards require that non-bank servicers pay greater attention to operating liquidity needs that refer to the funds necessary to perform normal business operations beyond the servicing liquidity requirements. Regarding corporate governance, the

⁵³ These standards align closely with existing requirements at the federal level, mitigating regulatory burden while establishing guardrails for compliance within the state system of supervision that are complimentary rather than duplicative.

⁵⁴ Currently, the FHFA requirements for non-bank servicers include minimum net worth of USD 2.5 million and a minimum ratio of 6% for tangible net worth to total assets. Also, the minimum liquidity requirements include a base servicing liquidity requirement of 3.5 basis points of total servicing and an incremental non-performing loan (NPL) charge of 200 basis points on NPLs greater than 6% of total servicing. Total servicing is calculated by excluding subservicing for others and reverse mortgage servicing.

Final Model Standards include requirements for a board of directors or similar structure responsible for all aspects of corporate oversight, internal and external audits and risk management.

The Final Model Standards would be subject to some limitations that would necessitate to consider additional relevant risk factors for more efficient regulatory requirements⁵⁵

The capital regulatory standards are not defined using a risk-based approach for non-bank mortgage lenders' assets in contrast with the bank regulatory framework that takes many factors into account. Also, the maturity and capacity of its debt facilities, the effectiveness of its hedging strategies, or the idiosyncratic aspects of its business model are not considered for liquidity requirements. In addition, the GSE liquidity surcharge of 200 basis points when delinquencies reach a certain level may require non-bank servicers to raise more funds at a time when they may already be under financial stress. A countercyclical requirement would be a more suitable approach. Therefore, regulatory requirements for non-bank mortgage lenders and servicers may not be completely adequate relative to the risks posed by these firms. Further consideration should be given to additional relevant risk factors to define efficient capital and liquidity requirements for non-bank mortgage lenders and servicers. However, would regulators detect some rising vulnerabilities at a particular firm, they may decide to impose more stringent capital and liquidity requirements on a firm-by-firm basis to mitigate idiosyncratic risk and spillovers that may threaten resilience of the sector and possibly beyond. This suggests that more work is needed to further develop and implement various tools to address vulnerabilities of mortgage lenders and servicers. Also, the assessment of the use and the efficacy of these tools would ensure they help to mitigate excessive risk taking, with respect to liquidity and leverage, and improve resilience during periods of stress.

⁵⁵ Kaul and Goodman (2016); Kim et al. (2018).

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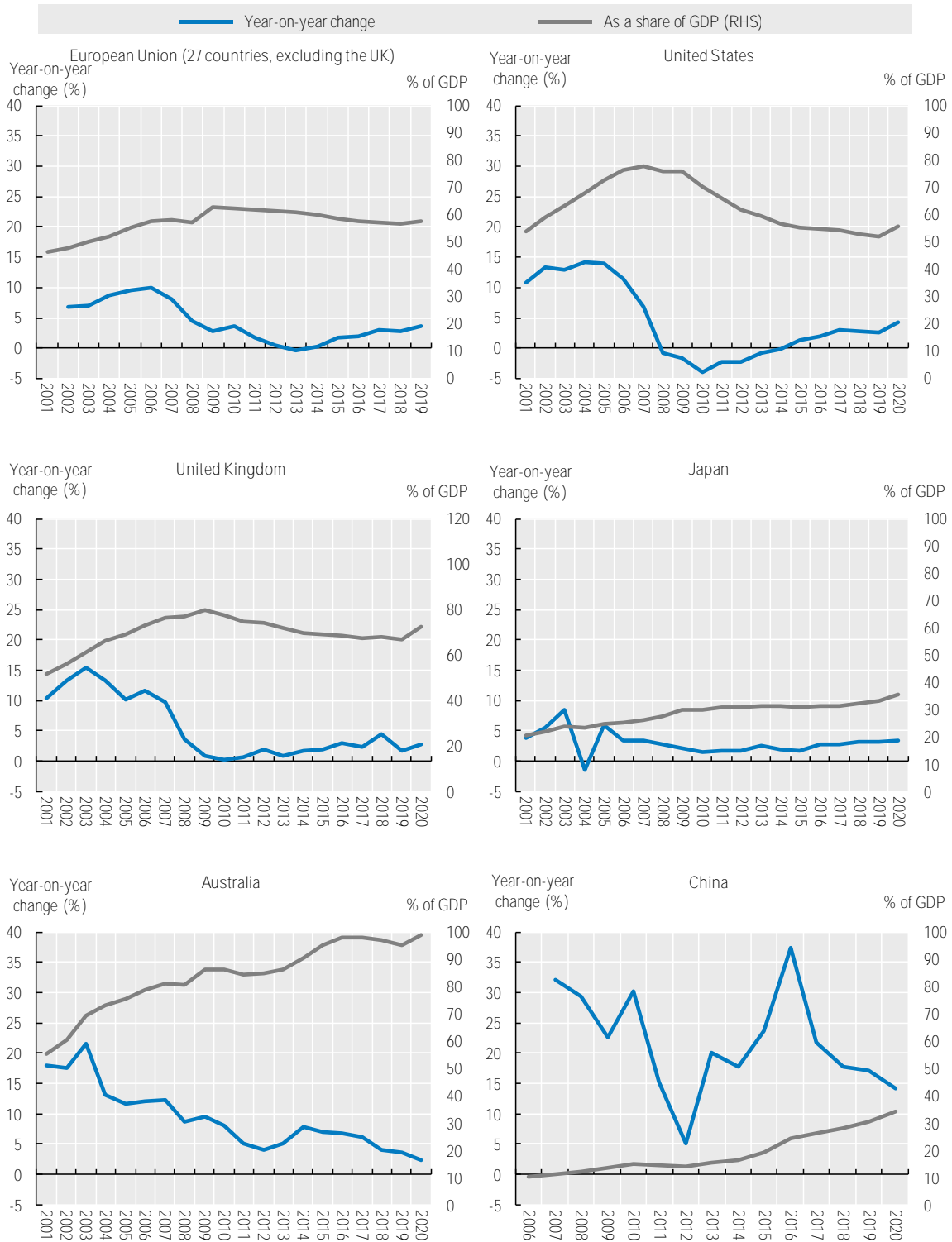
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Annex A. Real estate mortgage lending in selected major real estate finance markets

Residential and commercial real estate lending have recovered since the GFC in major real estate finance markets with even some credit exuberance detected in particular residential real estate mortgage markets.

Focusing on major real estate finance markets, growth of both residential and commercial mortgages has substantially fallen over the post-GFC period compared to the couple of years before the crash (Figure 31). However, both residential and commercial real estate lending have recovered over the last decade as reflected by increasing growth rates in most jurisdictions. Even some credit exuberance may be detected in Australia and several European economies (i.e. Denmark, Netherlands, Sweden and Cyprus) with elevated housing loan-to-GDP ratios standing at historically high levels in 2020 close to 100% of GDP (Figure 32). Also, housing loan-to-GDP ratios are following up-ward trends in Japan and China but they are standing at more moderate levels (i.e. about 35% GDP). However, in the United States and to a lesser extent in the United Kingdom, while residential mortgages in nominal terms are increasing, ratios to GDP have declined to more moderate levels over the last decade. In several European economies (i.e. Romania, Latvia, Hungary, Lithuania, Bulgaria, and Slovenia), housing loan-to-GDP ratios are even standing at relatively low levels, namely below 30% of GDP in 2020. This suggests that in these several European economies, in the United States and in the United Kingdom, the expansion of the housing loan market is much more moderate than the expansion of other sectors.

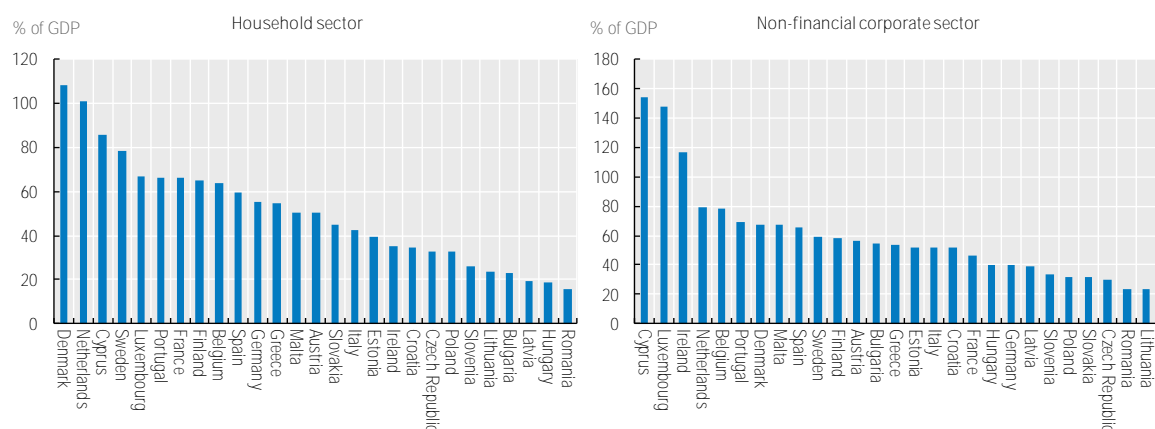
Figure 31. Residential mortgages in selected major real estate finance markets, 2001-2020



Note: Data shown in these figures are long-term loans (i.e. the term of a real estate mortgage is generally of several years) to households in the European Union (excluding the United Kingdom), long-term loans on secured dwellings in the United Kingdom and loans to households for housing in Australia, China, Japan and the United States.

Source: Eurostat, Federal Reserve, ONS, Bank of Japan, Australian Bureau of Statistics, The Peoples' Bank of China, Refinitiv, OECD calculations.

Figure 32. Long-term loan-to-GDP ratio for households and non-financial corporations in selected European economies, 2020



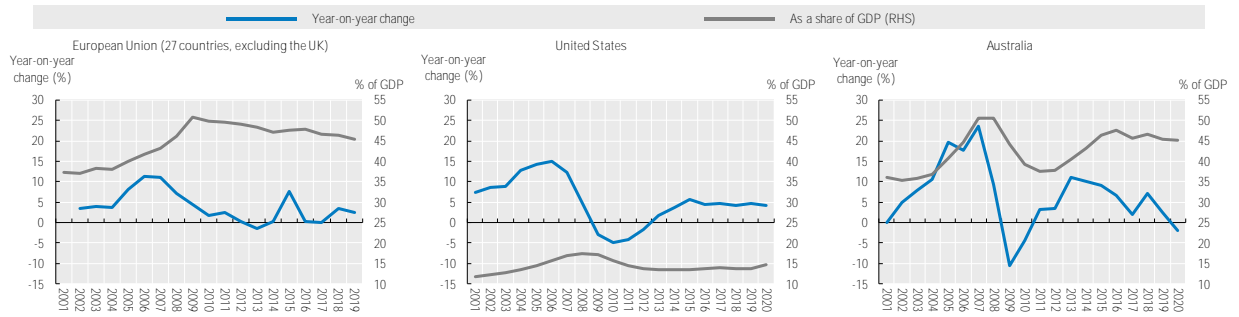
Note: Data shown in these figures are long-term loans (i.e. the term of a real estate mortgage is generally of several years) to households or non-financial corporations for selected European Union economies (excluding the United Kingdom) in 2020.

Source: Eurostat, Refinitiv, OECD calculations.

Considering commercial real estate lending,⁵⁶ in the European Union (excluding the United Kingdom) and the United States, while commercial mortgages in nominal terms are increasing, ratios to GDP have declined to more moderate levels (Figure 33). Nevertheless, some credit exuberance may be detected in several European economies with elevated non-financial corporations loan-to-GDP ratios standing at historically high levels in 2020 close to or above 100% of GDP (i.e. Luxembourg, Cyprus, Ireland, Belgium, Netherlands, Denmark, Sweden). In Australia, commercial real estate lending has been negatively affected by the COVID-19 crisis as reflected by the decline in lending in nominal terms in 2020. While ratio to GDP has recovered since the GFC, it has remained flat over the recent years, suggesting that the expansion of the real estate commercial loan market is similar to the expansion of other sectors.

⁵⁶ Data for real estate lending to non-financial corporates are only available in national statistical databases for the European Union (excluding the United Kingdom), the United States and Australia.

Figure 33. Commercial real estate loans in selected major real estate finance markets, 2001-2020



Note: Data shown in these figures are long-term loans (i.e. the term of a real estate mortgage is generally of several years) to non-financial corporations in the European Union (excluding the United Kingdom), commercial mortgages in the United States and long-term loans to non-financial corporations in Australia.

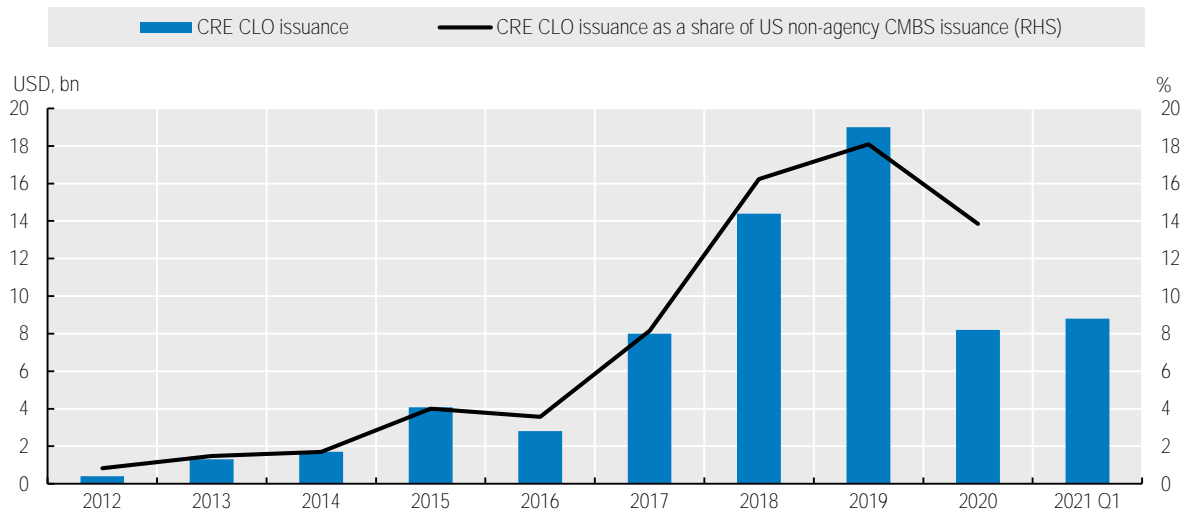
Source: Eurostat, Federal Reserve, Australian Bureau of Statistics, Refinitiv, OECD calculations.

Annex B. The rising prominence of the CRE CLO market

While CRE CLOs have common characteristics, they are different from CMBS in a number of key ways and may offer some significant benefits (Trepp, 2020; and FS Investments, 2021).

- First, the underlying assets of a CRE CLO are short-term floating rate loans collateralized by transitional properties. As a comparison, the underlying loans of CMBS are typically fixed rate loans with terms often ranging from five to ten years with underlying collateral including fully stabilised properties across various CRE sectors. Transitional assets in CRE CLOs include a wide range of properties, i.e. from a lease-up on new construction to fully stabilised. Therefore, heavy transitional assets may include more significant repositioning or a full lease-up that enable underlying loans to be more highly structured and customised to individual business plans, giving lenders tight controls on borrower activities and property cash flows.
- Second, unlike the pools of loans in a CMBS transaction, which are largely static, the trend in the CRE CLO market has been toward managed deals where the sponsor or manager of the pool is permitted to add and remove loans during a specified reinvestment period. Such flexibility provides an additional layer of safety as managers have much greater degree of control. Also, better track records tend to lower costs of capital over time (i.e. bonds can be sold at lower interest rates).
- Third, the first-loss risk of the CRE CLOs in the pool remains with the party that originated the loans while in CMBS offerings it is often sold to a third-party investor that may not have been involved in originating the underlying loans. As a result, the CRE CLO manager is likely to be more familiar with the underlying properties and have a closer relationship with the borrowers that may facilitate tied management of the underlying loan pool.

Figure 34. CRE CLO annual issuance, 2012-2021



Source: SIFMA, Bloomberg, OECD calculations.

CRE CLO annual issuance have grown at a fast pace since 2012, surging from USD 0.4 billion in 2012 to a historical peak in 2019 standing at USD 19 billion (Figure 34). In 2020, issuance have declined by more than half amid the COVID-19 crisis. Nevertheless, delinquency rate in the CRE CLO market has remained below 3% since March 2020 (Bloomberg, 2021a) while CMBS has climbed to over twice as high (Trepp, 2021). Other stress factors, such as modifications and special servicing, have also remained relatively muted in the CRE CLO market.

Market participants are expecting strong CRE CLO issuance in 2021 and beyond (Global Capital, 2021), as reflected by issuance during first quarter 2021 that already exceed 2020 issuance, driven by a combination of factors at both the loan level and investor demand in a context of rising expected inflation and interest rate normalisation. At the loan level, an increase in demand for transitional loans is expected as the owners of these assets assess the changing needs of their tenants that are reassessing their use of real estate across all segments. Also, investors are attracted to shorter duration bonds with floating rates, which provide protection to potential changes in interest rates. Nevertheless, the underlying credit quality of the CRE loans and the CRE CLO sponsor's ability to actively manage its portfolio remain crucial to promote a sustainable expansion of the CRE CLO market.

The development of CRE CLO market suggests that not all segments of commercial real estate securitisations are created equal. The market is constantly evolving, and key differences in the specific risks of the several products should be carefully understood and monitored by the several stakeholders to strengthen resilience.

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