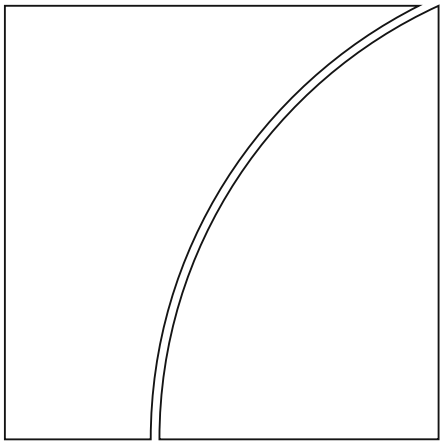
Committee on the Global Financial System



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Property price dynamics: domestic and international drivers

Report prepared by a Study Group chaired by
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The term "country" as used in this publication also covers territorial entities that are not states as understood by international law and practice but for which data are separately and independently maintained.

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Preface

Commercial and residential property markets show strong growth in several jurisdictions. Moreover, prices have become more synchronised across countries over the past decade and at the same time international investors have been increasing their presence in local real estate markets. Central banks monitor closely developments in property markets given the central role that boom-bust cycles in real estate have played in generating financial system fragility in the past with very significant adverse effects on the macroeconomy.

With this in mind, the Committee on the Global Financial System (CGFS) mandated a Study Group chaired by Paul Hilbers (the Netherlands Bank) to document trends in residential and commercial property prices, provide an overview of their drivers (including the role of international investors), and describe policy initiatives undertaken to mitigate vulnerabilities arising from property price growth in CGFS jurisdictions.

The following report presents the Group's findings about developments in property prices and their drivers and brings up three highlights. The first is that property prices have been rising, reaching record highs in many countries. In some jurisdictions, prices appear elevated when judged against simple rule-of-thumb benchmarks, like rents or incomes. In many cases, however, current price developments can be largely explained by fundamental drivers such as interest rates and income. The second highlight is that although prices (both residential and commercial) have become more synchronised over the past years, this does not mean that there is a global real estate market. There remains significant cross-country heterogeneity in price dynamics, which reflects differences in the strength of local drivers. A third highlight is evidence of international investors' growing footprint in many markets. The evidence presented in this report shows that their activity affects local real estate prices, especially for commercial property, although the precise size of the impact is hard to pin down. From a policy perspective, their growing importance presents challenges since foreign demand is less sensitive to macroprudential measures that affect the supply of domestic credit for property investments.

I hope that this report provides a useful input to researchers and policymakers looking to better understand the dynamics of property prices across countries and put domestic market developments in context.

Philip Lowe

Chair, Committee on the Global Financial System
Governor, Reserve Bank of Australia

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Executive summary

Property prices have reached record highs in several jurisdictions and property markets have become more synchronised across countries in the post-crisis period. Moreover, international investors have been increasing their presence in local real estate markets. Against this backdrop, this report documents trends in residential and commercial property prices, provides an overview of their drivers (including the role of international investors), and concludes by describing policy initiatives undertaken to mitigate vulnerabilities arising from property price growth in CGFS jurisdictions.

The empirical analysis in this report largely confirms the importance of standard drivers for local property price dynamics in both residential and commercial markets, albeit with substantial country heterogeneity. House prices are boosted by higher disposable income and population growth, by looser credit conditions, and by lower interest rates. Likewise, commercial real estate prices tend to increase with GDP growth, and decline when interest rates and returns on alternative investments are higher.

The report also documents the strengthening of international co-movement as a new element of property price dynamics in both the residential and the commercial real estate segments. That said, higher synchronisation does not mean that there is a "global market" for real estate as for other financial assets. There are differences between residential and commercial real estate markets, as well as across jurisdictions. Within the commercial real estate sector, the office and retail segments are also not entirely alike.

The empirical analysis furthermore provides some preliminary evidence that international investors have an impact on local property prices, although the exact size of this impact is difficult to quantify. Prices are found to be positively correlated with capital inflows – an admittedly less than perfect proxy for the footprint of foreign investors – in both the residential and the commercial real estate market. That said, the influence of international investors' activity is relatively clearer in the commercial segment.

A number of case studies complement the empirical analysis and bring out three themes. First, the footprint of foreign investors in local residential real estate markets has been on the rise in recent years in a number of jurisdictions (eg Canada, Hong Kong SAR, Singapore, Spain). That said, it is still smaller than the relative share of international investors in commercial real estate markets in countries such as Belgium, the Netherlands and the United Kingdom. Second, there are signs that the share of foreign investors is positively correlated with price growth in these jurisdictions, and that some of the impact of these investors may work through local expectations. This correlation may be partly driven by their willingness to pay a higher price compared with domestic investors, possibly related to yield-seeking in the low interest rate environment. More empirical work in this area would be needed to derive hard conclusions. Third, making a full assessment of the impact of foreign investors can be complicated by simultaneous changes in supply. In Australia, for example, international developers were instrumental in increasing the supply of property at a time when demand had surged.

Developments in property markets have a bearing on financial stability and are influenced by instruments related to different areas of public policy. The report provides a brief overview of policies deployed in different jurisdictions to bolster the

resilience of the financial system. In recent years, several countries have employed macroprudential policies. By and large, these measures have targeted residential markets, although some jurisdictions have relied on capital measures to reduce imbalances in commercial property markets. In addition to macroprudential tools, a number of countries have resorted to fiscal measures (eg stamp duties), which have occasionally targeted international investors.

Whether the tools employed thus far will be adequate and sufficient to address the risks associated with an increased role for international investors in a number of jurisdictions remains an open question. However, evidence from case studies seems to suggest that, because foreign investors rely relatively less on local funding than local investors, fiscal measures (eg higher stamp duties on foreign buyers) could be more effective in containing foreign activity than domestic credit measures.

Introduction

Over the past few years, both residential and commercial property markets have been booming in several jurisdictions, with strong growth in prices and investment volumes. There are signs that the investor mix may be becoming more international. A prolonged low interest rate environment combined with lacklustre economic growth prospects is raising issues of sustainability. As boom and bust patterns in real estate have contributed to the fragility of the financial system in previous crises, there are concerns about the consequences of a potential price correction should fundamentals deteriorate or market sentiments change.[1]

Price declines could impinge on financial stability through a number of channels. First, there are adverse consequences arising from owner-occupiers (households and firms). Access to credit for households and firms could deteriorate as collateral values decline, possibly resulting in a contraction in economic activity as the former cut consumption and the latter reduce investment. And this diminished borrowing capacity would come at the same time as owner-occupiers experience balance sheet losses, exacerbating their consumption and investment cuts through wealth effects. Second, negative effects can arise because of lenders' exposures. As banks hold both direct and indirect exposures to real estate, falls in property prices would result in balance sheet losses and possibly decrease lending to the real economy, further exacerbating the contraction. A third set of potentially harmful implications stems from investors in real estate. Some commercial property investment funds, for example, combine leverage and maturity mismatches, and can thus amplify price swings.[2]

Against this backdrop, this report begins by documenting trends in residential and commercial property prices in a number of jurisdictions around the globe (Section 1). It then provides an overview of the relationship between real estate property prices and their drivers, including the role of international investors (Section 2). The report concludes by describing different policy initiatives that have been undertaken to curb property price growth and mitigate ensuing vulnerabilities in CGFS jurisdictions (Section 3).

1. Property markets: trends and facts

This section provides an overview of the main trends in property prices in a number of jurisdictions around the globe. It shows that both residential and commercial real estate prices have reached record highs in several countries, although there are signs that growth is abating in some jurisdictions; that, compared with rents, prices in both the residential and the commercial space look elevated by historical standards in a number of jurisdictions; and that both residential and commercial real estate prices have become more synchronised in the post-crisis period.

[1] For example, IMF, "Downside Risks to House Prices", *Global Financial Stability Report*, April 2019, shows that lower house price momentum, overvaluation, excessive credit growth, and tighter financial conditions predict heightened downside risks to house prices up to three years ahead.

[2] Open-ended funds offer daily fund share redemptions but may have to liquidate illiquid real estate assets in order to do so. To allow for the possibility of redemptions, these funds hold a mix of liquid reserves (cash or shares in real estate investment trusts, or REITs) and illiquid commercial property.

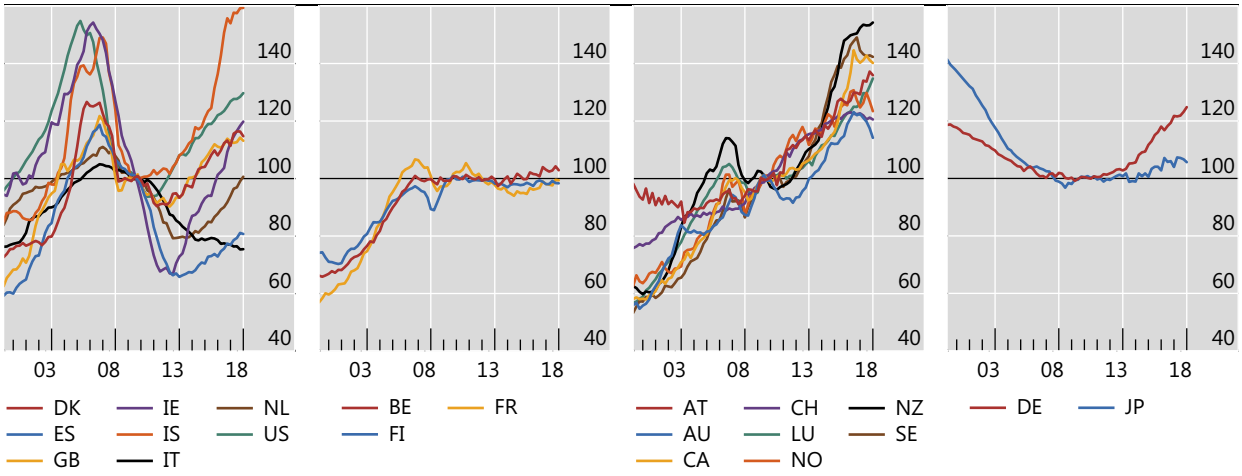
Residential property markets

Real residential property prices are currently at record levels in a number of jurisdictions, but this reflects different country paths in both advanced economies (AEs) and emerging market economies (EMEs) (Graphs 1 and 2). Among AEs, some jurisdictions experienced a boom, a bust around the Great Financial Crisis (GFC) of 2007–09 and then different degrees of recovery (Graph 1, first panel).[3] In Belgium, Finland and France, prices have plateaued over the past decade, after booming prior to the GFC (second panel). In a third group of countries, house prices have been trending upwards for most of the period, but have declined or been unchanged over the past year or two (third panel). Finally, house prices in Germany and Japan picked up in the aftermath of the crisis, following a prolonged decline (fourth panel).[4]

Real price growth in several EMEs had also turned positive within a few years of the GFC, with Korea and Singapore being notable exceptions (Graph 2). As in the case of AEs, price dynamics look more diverse when casting back to the early 2000s.[5] Lithuania, Singapore and South Africa experienced boom and bust dynamics in real residential property prices around the GFC (left-hand panel), and prices have yet to reach their previous peaks. Residential real estate prices in another group of EMEs – including Hong Kong SAR – did not decline in the aftermath of the GFC, and have witnessed robust growth since around 2010 (centre panel). By contrast, price growth

Residential real estate price dynamics since 2000 (AEs)[1]

2010 = 100 Graph 1



[1] Nominal prices deflated by CPI.

Sources: National data; BIS.

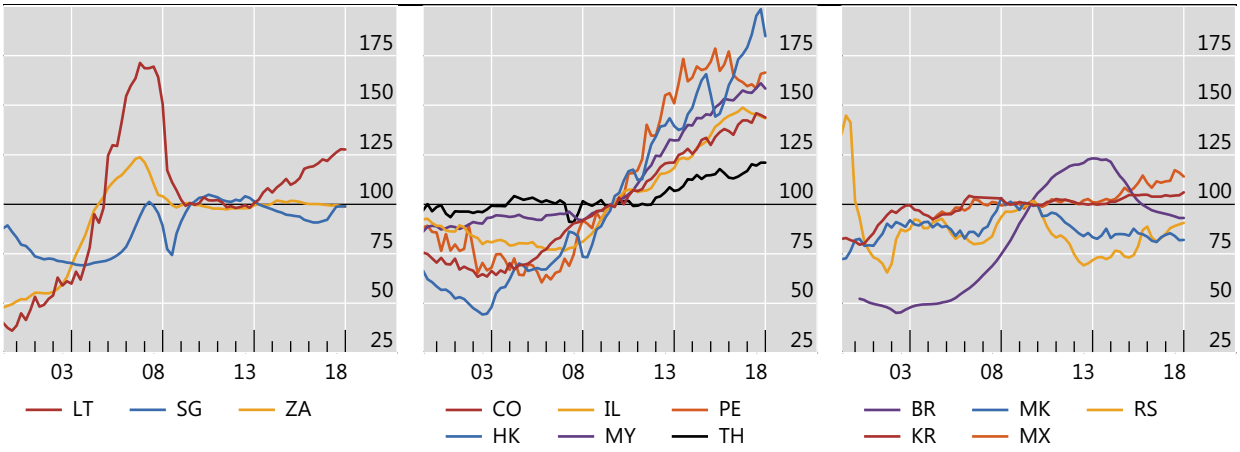
[3] House prices in Italy had not yet recovered at the end of 2018.

[4] Country groupings were obtained as follows. First, a metric of ``distance'' between the time series was obtained using a dynamic time warping algorithm to account for lags in peaks and troughs. Second, hierarchical clustering was performed on the distance matrix. 4 clusters were selected. The cluster assignment was not perfect, so Denmark, Iceland and the United Kingdom were manually reassigned from the cluster shown on the second panel of Graph 1 to the cluster shown on the first panel.

[5] As for advanced economies, the cluster assignment of EMEs was not perfect. Korea was manually reassigned from the cluster shown in the left-hand panel of Graph 2 to the cluster shown on the right-hand panel. And because the time series for Brazil and Mexico are shorter and thus were not used in the cluster-based analysis, the two countries were added manually to the right-hand panel of Graph 2.

Residential real estate price dynamics since 2000 (EMEs)[1]

2010 = 100 Graph 2



[1] Nominal prices deflated by CPI. Data for BR start in Q1 2001. Data for MX start in Q1 2005.

Sources: National data; BIS.

in Korea, Mexico and Russia has been subdued since 2010 (right-hand panel). Residential property in Brazil underwent a protracted and pronounced boom: prices more than doubled between 2001 and 2014. The expansion has been followed by an ongoing decline.

Simple valuation and affordability metrics are above trend in a number of jurisdictions (Graph 3).[6] With the exception of Italy and Switzerland, most jurisdictions in the sample experienced price growth over the three years to end-2018, albeit to different degrees.[7] Most of the "boom/bust/recovery" countries shown on the first panel of Graph 1 experienced growth in excess of 5% (Graph 3, red dots). In this group of countries, prices appear high compared with rents as of end-2018. The price/rent ratio – the housing equivalent of the price/dividend ratio for stocks – was largely above trend (left-hand panel, red dots).[8] The jurisdictions that did not experience large booms and busts around the GFC similarly underwent price growth between late 2015 and late 2018, except Switzerland. In those countries, however, prices look low relative to rents, with price/rent ratios broadly below trend (Graph 3, yellow dots). Price/income ratios – a measure of affordability – paint a more blurred picture (right-hand panel). In the "sustained growth countries", prices look low relative to both rents and incomes (yellow dots). By contrast, among the boom/bust/recovery countries, price/income ratios are above trend in Ireland, the Netherlands and Spain, but below in the United Kingdom and the United States (red dots). That said, deviations from trend appear to be moderate (around or below 5%).

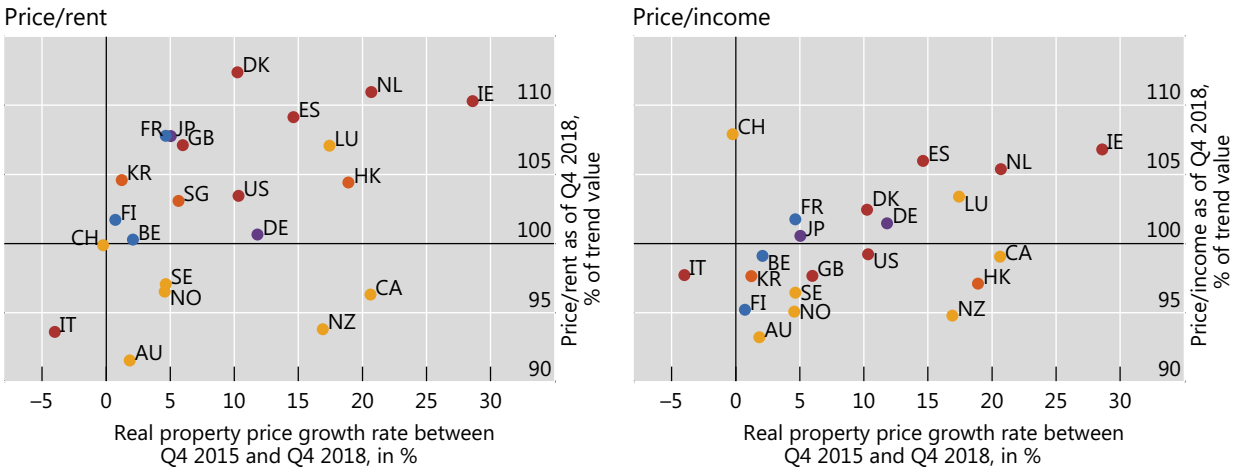
[6] Simple valuation ratios, such as those depicted in Graph 3, are illustrative. They are based on a number of assumptions regarding the stability of the underlying trend, the adjustment dynamics of prices and rents (as discussed below), and the importance of other factors (such as interest rates) that may influence property prices. A more detailed empirical analysis is discussed in the next section.

[7] Prices in Canada and the Netherlands grew by over 20% in real terms, while in Australia, Belgium, and Korea price increases were all below 3%.

[8] In Italy, by contrast, prices have declined, and they appear low relative to rents.

Residential real estate price growth and valuations[1]

Graph 3



[1] Nominal prices deflated by CPI; trend in valuation metrics computed using the methodology set out in J Hamilton, "Why you should never use the Hodrick-Prescott filter", *The Review of Economics and Statistics*, December 2018. The trend of variable x at time t is computed as the fitted value of a regression of x_t on some of its lags, $x_t = \beta_0 + \beta_1 x_{t-8} + \beta_2 x_{t-9} + \beta_3 x_{t-10} + \beta_4 x_{t-11} + \varepsilon_t$. Price/rent data starting in Q1 1975 and ending in Q4 2018. Price/income data starting in Q1 1980 and ending in Q4 2018. Coverage may vary for each country depending on data availability. The red dots correspond to the countries in the first panel of Graph 1; the blue dots to the countries in the second panel; the yellow dots to the countries in the third panel; the purple dots to the countries in the fourth panel; and the orange dots to EMEs.

Sources: OECD; national data; CGFS Study Group calculations; BIS.

Against this backdrop, risks to the price outlook could go either way depending on the preferred view of house price determination. A forward-looking perspective implies that a higher price/rent ratio could signal future price growth. All else equal, if house prices increase relative to rents, the cost of renting vs buying falls, and homeowners must expect capital gains to be indifferent between renting and buying.[9] According to this efficient market view, houses can be neither overvalued nor undervalued – prices are always "right", and so are expectations. An alternative, backward-looking view of residential real estate prices, instead, maintains that elevated levels of price/rent ratios should be associated with future price declines. The rationale is that if home ownership looks more expensive relative to renting than it has been in the past, house prices should correct downwards (although the adjustment may also happen through rents).[10] A lower price/income ratio could also be expected to point towards future price growth.[11]

[9] This view is embedded in the user cost of capital framework, which postulates that market forces should equate the cost of renting – the rent/price ratio – with the risk-adjusted cost of home ownership – the user cost of capital net of expected appreciation in house prices. Formally, this can be written as $R/P = u - \Delta P/P$, where R/P is the rent/price ratio, u is the nominal user cost of capital (a function of interest rates, taxes and the risk premium associated with owning a dwelling) and $\Delta P/P$ is expected house price appreciation.

[10] In other words, expectations of future capital gains may not be consistent with historical relationships. That said, historical relationships need not always be a good basis for predicting future dynamics (eg there may be regime shifts). This also assumes that average rents evolve smoothly over time.

[11] See J-C Bricongne, A Turrini and P Pont'uch, "Assessing house prices: insights from 'Houselev', a dataset of price level estimates", European Commission, *Discussion Paper* 101, July 2019, for evidence in line with this prediction.

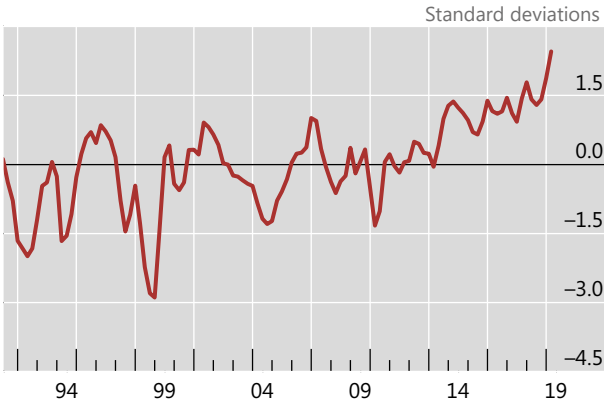
International synchronisation

Co-movement between residential real estate prices around the globe has increased since the mid-2000s. A measure of price synchronisation based on average price growth differentials has been on an upward trend in the last 15 years (Graph 4, left-hand panel). The increase in synchronisation is consistent with the evidence presented in Graphs 1 and 2, which show the majority of countries exhibiting either boom/bust/recovery dynamics or largely sustained growth dynamics in the period since 2000.[12] Greater price co-movement can also be seen through a different prism, by looking at the share of price volatility explained by shared statistical factors (Graph 4, right-hand panel). These "common factors" are identified through a principal component analysis (PCA) as the principal components accounting for a higher than average share of the price variance.[13] They are common to groups of countries, and possibly to the entire cross section. In the period since Q1 2005, the share of residential real estate price variance explained by common factors has increased in over half the countries in the sample, with Germany, Hong Kong, Korea, the Netherlands and Spain registering increases in excess of 10 percentage points. By contrast, housing prices in Canada, Japan and Sweden appear to have become less sensitive to common factors since the GFC.

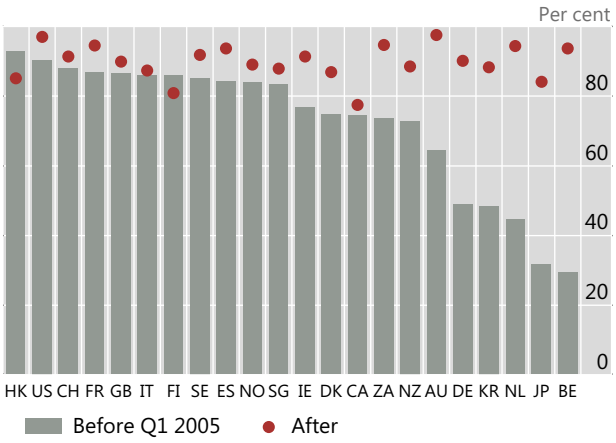
Residential real estate price synchronisation[1]

Graph 4

Synchronisation in house prices[2]



Share of price variance explained by common factors[3]



[1] Nominal prices deflated by CPI. [2] The synchronisation measure is computed by averaging $S_{i,j,t} \equiv 100 - |g^P_{i,t} - g^P_{j,t}|$ over unique country pairs (i,j) for all quarters t, where $g^P_{i,t}$ is the year-on-year growth rate of house prices in country i, measured at quarterly frequency and expressed as a percentage. One hundred means full synchronisation. The panel shows the z-score of the synchronisation time series. [3] Common factors are defined as the principal components (eigenvectors) with eigenvalues greater than 1. Retaining the eigenvectors with eigenvalues greater than 1 is a commonly used factor criterion in PCA. It is motivated by the fact that the average of eigenvalues has to be equal to 1, so eigenvalues greater than 1 are "above average". The share of house price variance in country i explained by common factors is the R^2 of a regression of the real house price series $\{P_{i,t}\}$ on the N eigenvectors of the entire price sample with eigenvalues greater than 1.

Sources: National data; CGFS Study Group calculations; BIS.

[12] These developments are consistent with evidence in IMF, "House price synchronisation: what role for financial factors", *Global Financial Stability Report*, April 2018.

[13] The PCA was performed on the time series shown in Graphs 1 and 2. There are six common factors in the period before Q1 2005 and five common factors after. Not all countries load with the same intensity on all factors.

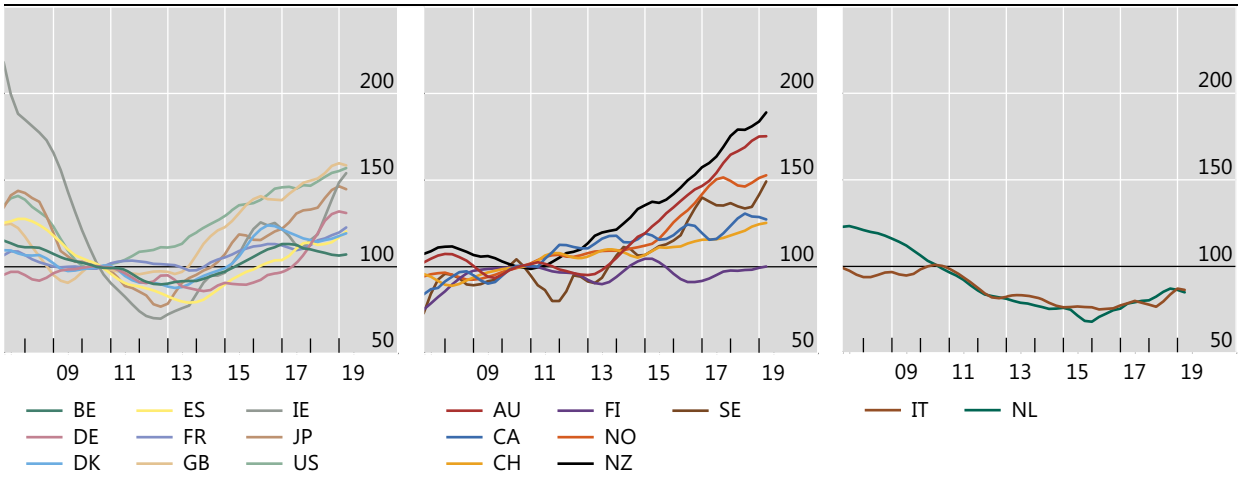
Commercial property markets

Commercial properties comprise office buildings, retail and industrial spaces, rental housing and hotels, with offices and retail accounting for the lion's share of the non-residential market by floor space area. These properties are typically acquired for investment purposes, making the commercial real estate market more cyclical than its residential counterpart.[14] This is because investors expecting rental income loss in a downturn sell their properties, pushing down prices. The opposite happens in an upturn. On account of a lower supply elasticity, a larger footprint of international investors and a greater price sensitivity to speculative pressures (commercial real estate being an asset class in its own right), the commercial market is also thought to be more volatile.

Office and retail price dynamics started looking increasingly similar by 2013, with real prices on the rise in a number of advanced economies (Graphs 5 and 6).[15] That said, there are significant differences in the timing of this rally. In countries that experienced a bust around the GFC in either the office or the retail market – or both, like Japan and the United States – growth in real prices took longer to turn positive (left-hand panels). Elsewhere, price growth has been muted, with Italy and the Netherlands registering a downward trend in both markets (centre and right-hand panels) and Germany experiencing losses in the retail space (Graph 6, centre panel).[16]

Office price dynamics since 2007 (AEs)[1]

2010 = 100 Graph 5



[1] Nominal prices deflated by CPI.

Sources: Real Capital Analytics; national data; CGFS Study Group calculations.

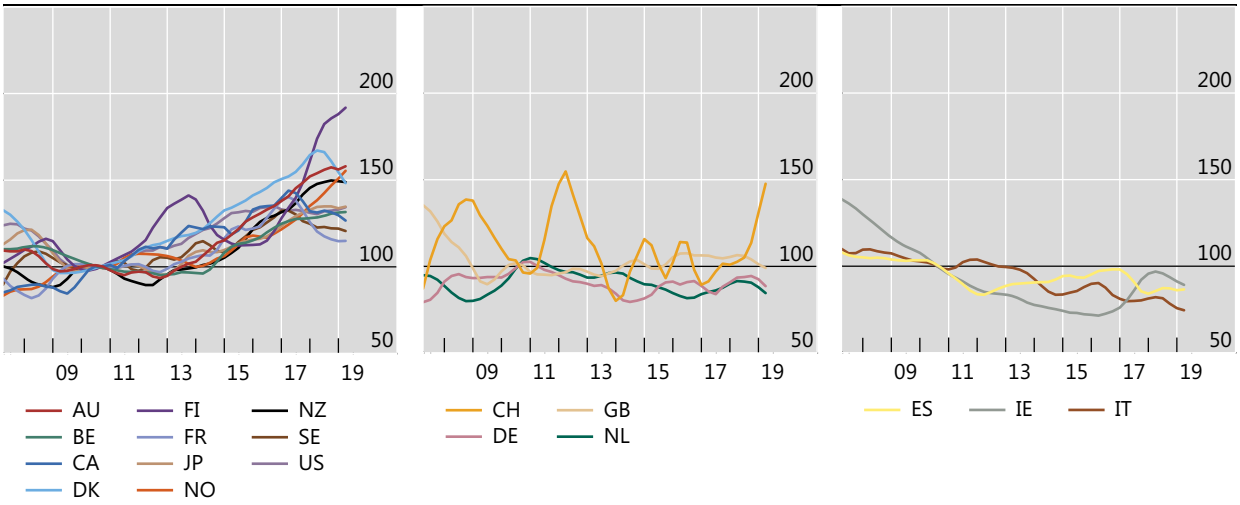
[14] Using longer time series than those available for writing this report, Ellis and Naughtin (2010) show that – in Australia, France, Ireland, Spain, the United Kingdom and the United States – commercial prices contracted significantly more around the financial crisis than residential prices. See Table 1 in L Ellis and C Naughtin, "Commercial property and financial stability", Reserve Bank of Australia, *Bulletin*, June Quarter 2010.

[15] There are no officially sanctioned, internationally comparable property price statistics for commercial real estate (unlike for residential real estate). Central banks typically rely on data supplied by private providers. Graphs 5–7 are based on hedonic price series provided by Real Capital Analytics, deflated using the CPI and rebased to 2010. These data are not available before Q1 2007.

[16] Country groupings were obtained using the same approach employed to describe price dynamics in residential real estate markets (footnote 3). No manual re-classification was required.

Retail price dynamics since 2007 (AEs)[1]

2010 = 100 Graph 6



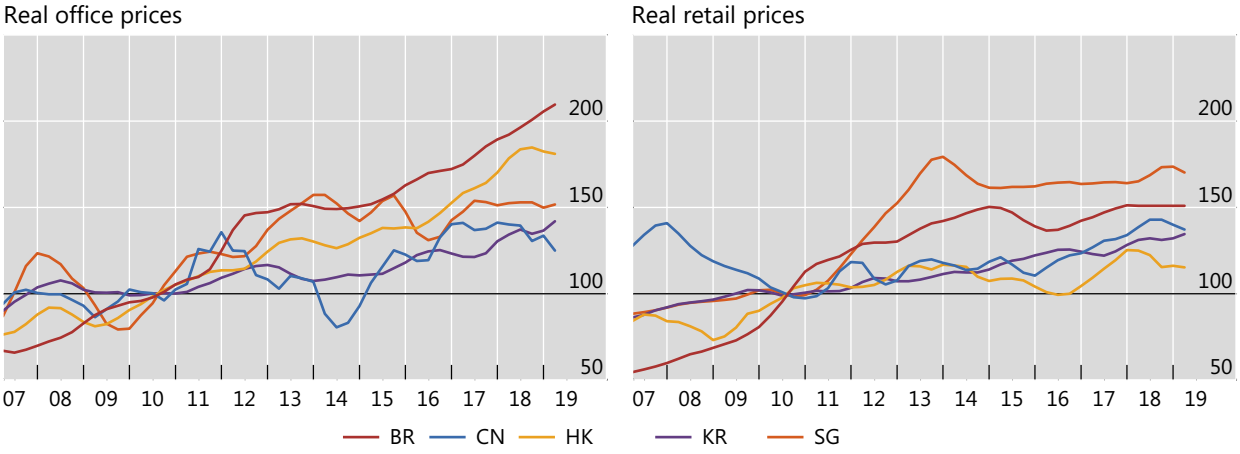
[1] Nominal prices deflated by CPI.

Sources: Real Capital Analytics; national data; CGFS Study Group calculations.

Price growth in EMEs appears to have been broadly robust in the period since 2010, particularly in the office market (Graph 7). Office buildings in Brazil are now twice as expensive as in 2010, with growth in Hong Kong not far behind. Retail prices in Singapore have climbed by a similar amount, although growth tapered after 2013. Commercial real estate prices in the EMEs in the sample have not featured the same boom/bust/recovery pattern around the GFC as they did in some of the AEs, with the possible exception of retail prices in China (right-hand panel). Korea provides an interesting example of divergence in price dynamics across the residential and commercial segments. While Korean house prices have been largely flat since 2000 (Graph 2, right-hand panel), commercial real estate prices have shown a strong upward trend in the post-crisis period.

Commercial real estate price dynamics since 2007 (EMEs)[1]

2010 = 100 Graph 7

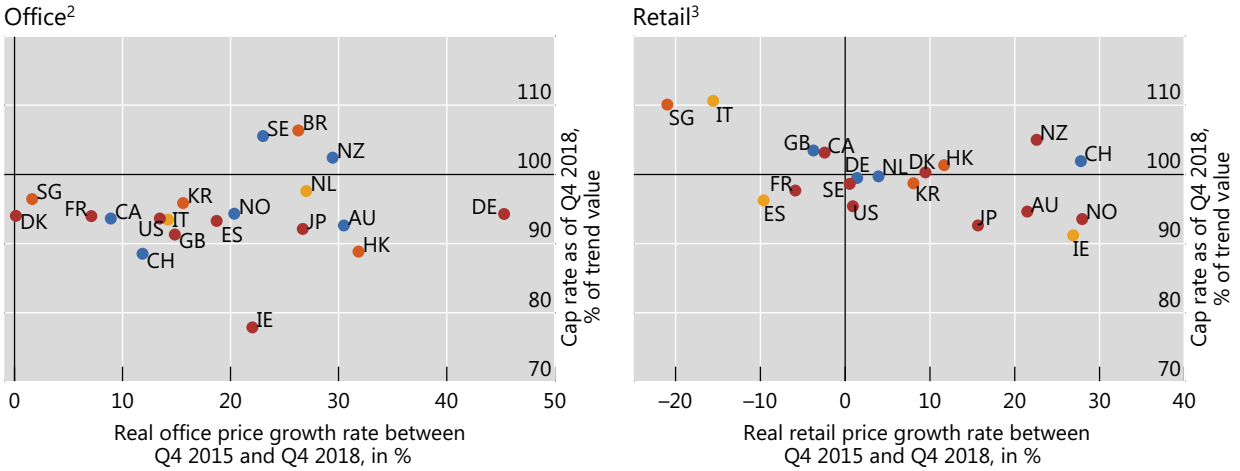


[1] Nominal prices deflated by CPI.

Sources: Real Capital Analytics; national data; CGFS Study Group calculations.

Commercial real estate price growth and valuations[1]

Graph 8



[1] Nominal prices deflated by CPI; trend in capitalisation rates computed using the methodology set out in J Hamilton, "Why you should never use the Hodrick-Prescott filter", *The Review of Economics and Statistics*, December 2018. The trend of variable x at time t is computed as the fitted value of a regression of x_t on some of its lags, $x_t = \beta_0 + \beta_1 x_{t-8} + \beta_2 x_{t-9} + \beta_3 x_{t-10} + \beta_4 x_{t-11} + \varepsilon_t$. Capitalisation rate data starting in Q1 2001 and ending in Q2 2019. [2] The red dots correspond to the countries in the left-hand panel of Graph 5; the blue dots to the countries in the centre panel; the yellow dots to the countries in the right-hand panel; and the orange dots to EMEs (Graph 7, left-hand panel). [3] The red dots correspond to the countries in the left-hand panel of Graph 6; the blue dots to the countries in the centre panel; the yellow dots to the countries in the right-hand panel; and the orange dots to EMEs (Graph 7, right-hand panel).

Sources: Real Capital Analytics; national data; CGFS Study Group calculations.

Valuation metrics suggest that prices look high relative to rents in a number of jurisdictions, possibly raising issues about the sustainability of current price levels (Graph 8). Over the three years to June 2019, price growth was particularly robust in the office market: most jurisdictions registered price increases of over 10% (left-hand panel). Price dynamics in the retail sector appear more heterogeneous, with Canada, France, Italy, Spain and the United Kingdom all seeing declines in real terms (right-hand panel). Office capitalisation rates – the ratio of the rental income generated by a commercial property to its price, the commercial real estate analogue of the rent/price ratio – were broadly below trend as of end-2018. While Brazil and Sweden stood out with above-trend readings of the office capitalisation rate, elsewhere cap rates were low as of end-2018, with Hong Kong and Switzerland more than 10% below trend (left-hand panel). By contrast, retail capitalisation rates exceeded trend values in Canada, Italy, Switzerland and the United Kingdom (right-hand panel), indicating that retail prices are low relative to rents.

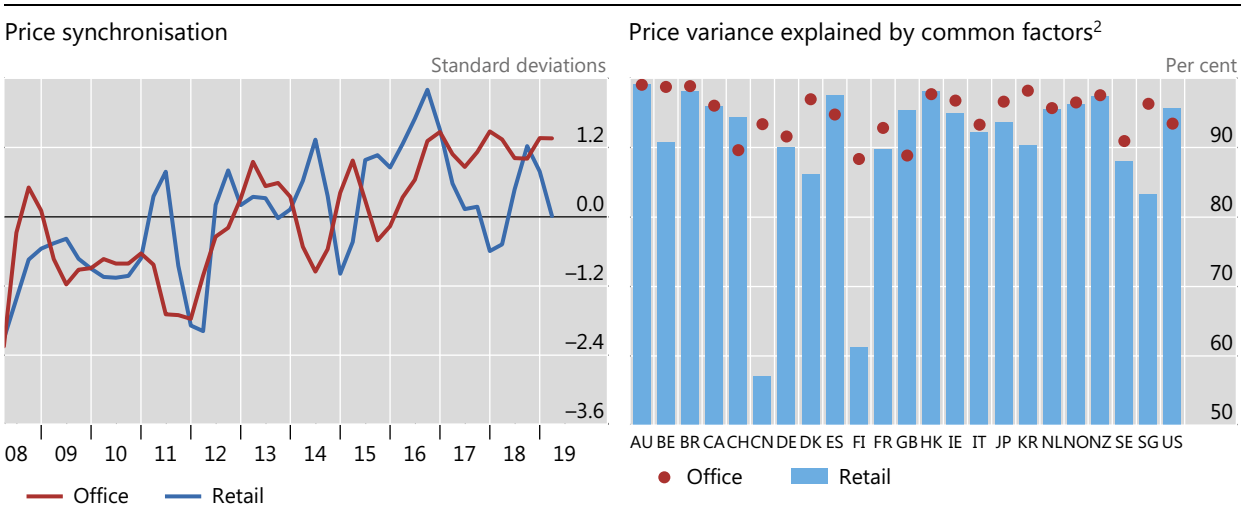
As in the case of residential real estate, a valuation-based assessment of possible risks to the price outlook would depend on the favoured view of price determination. A forward-looking view implies that a lower capitalisation ratio could signal future price growth. Rational investors understand that the value of a property should reflect the present discounted value of both its expected dividend stream and its expected resale value, and market forces ensure that property prices adjust to be equal to their values. All else equal, if rents decrease relative to prices, investors must expect capital gains. An alternative, backward-looking view of commercial real estate prices, instead, maintains that low capitalisation rates should be associated with future price declines. As rental income decreases relative to the cost of acquiring property, investors find commercial real estate a less attractive prospect, and prices fall.

International synchronisation

Co-movement between commercial real estate prices around the globe has increased in the aftermath of the GFC, with price synchronisation metrics trending up in both the office and the retail markets since 2011 (Graph 9, left-hand panel). Peaks and troughs in the synchronisation measure look to be well aligned across the two markets, although there are instances (mid-2013, mid-2014 and end-2017) when synchronisation peaked in one market and bottomed out in the other. The rise in synchronisation is consistent with the evidence presented in Graphs 5–7, which show the majority of countries exhibiting sustained price growth in this period. In line with these observations, common (statistical) factors account for a large share of commercial real estate price variation (Graph 9, right-hand panel).[17] In Australia, Brazil, Hong Kong and the Netherlands, common factors are found to explain over 95% of price volatility in both the office and the retail segments.

Commercial real estate price synchronisation[1]

Graph 9



[1] The synchronisation measure is computed by averaging $S_{i,j,t} \equiv 100 - |g^P_{i,t} - g^P_{j,t}|$ over unique country pairs (i, j) for all quarters t, where $g^P_{i,t}$ is the year-on-year growth rate of commercial real estate prices in country i, measured at quarterly frequency and expressed as a percentage. One hundred means full synchronisation. The panel shows the z-score of the synchronisation time series. [2] Common factors are defined as the principal components (eigenvectors) with eigenvalues greater than 1. Retaining the eigenvectors with eigenvalues greater than 1 is a commonly used factor criterion in PCA. It is motivated by the fact that the average of eigenvalues has to be equal to 1, so eigenvalues greater than 1 are "above average". The share of commercial real estate price variance in country i explained by common factors is the R^2 of a regression of the real commercial property price series $\{P_{i,t}\}$ on the N eigenvectors of the entire price sample with eigenvalues greater than 1.

Sources: Real Capital Analytics; national data; CGFS Study Group calculations.

[17] Common statistical factors are identified through a PCA performed on all the time series shown in Graphs 5–7. There are three such components for the office segment and five for the retail segment.

2. Drivers of property market trends

Residential property markets

This section begins by briefly discussing the relationship between different factors (drivers) and residential property price dynamics from a theoretical perspective. It then moves on to an empirical analysis to assess whether these predictions are supported by the data. The econometric exercises confirm the impact of standard demand drivers on residential property prices, and point to material cross-country variation in the sensitivity of prices to drivers. That said, attempting to capture the role of international investors through a simple proxy consistently comparable across countries – gross capital inflows – fails to deliver robust results. To address this issue, the section concludes by considering the role of non-resident buyers through the lens of a number of case studies. By and large, the case studies suggest that international investors have had a material impact on property price dynamics in a number of jurisdictions.

Drivers

The "dynamic user cost" framework is a useful tool to structure a discussion of drivers of residential property prices.[18] At its most basic, the framework focuses on housing prices, the housing stock and rents (endogenous variables). It relates each endogenous variable to the other endogenous variables, as well as to *interest rates*, *economic growth*, *demographic pressures* (demand drivers), and *building costs* (supply drivers).[19] At the heart of the model is the observation that market forces should adjust to make households indifferent between buying and renting. There is a "user cost relationship" linking house prices, rents and interest rates. According to this relationship, market forces should equate the cost of renting – the rent/price ratio – to the cost of home ownership – the interest income forgone upon purchasing a property net of expected house price appreciation.[20] A second relationship represents demand for housing, and states that rents are higher when the stock of housing is lower, but also that rents increase when households have more income to spend on accommodation services and when population increases. The model is completed by a third relationship capturing housing supply, which assumes that new housing is built when house prices increase relative to the marginal cost of building

[18] For a summary of the history of the user-cost-of-capital model in the context of housing, see C Mayer, "Housing bubbles: a survey", *Annual Review of Economics*, vol 3, no 1, pp 559–77, September 2011. IMF (2018), op cit, also adopts this approach to discuss demand/supply drivers. J Poterba, "Tax subsidies to owner-occupied housing: an asset-market approach", *Quarterly Journal of Economics*, vol 99, issue 4, November 1984, is one of the earliest contributions.

[19] The appropriate interest rate varies depending on structural characteristics of the local mortgage market. In Australia, Italy, Korea, Mexico, Spain and Sweden, where the majority of mortgages are adjustable rate, the relevant interest rate is a short-term rate. The appropriate rate is a long-term rate if mortgages are largely fixed rate (eg Belgium, Brazil, France, Germany, the Netherlands, Switzerland and the United Kingdom). Building costs should be interpreted as a catch-all variable representing *all* costs associated with supplying new housing, not just construction costs.

[20] The extent to which market forces can be expected to equalise the cost of renting to the cost of homeownership varies depending on how tightly regulated the rental market is. In jurisdictions that impose rent controls (eg the Netherlands and Sweden) the user cost relationship is unlikely to be an accurate representation of the relationship between house prices and rents.

new dwellings. The framework implies that house prices increase when interest rates fall; when disposable income and/or the size of population increase; and when building costs rise.

Other factors could also affect residential real estate prices. Since housing purchases are typically financed through mortgage loans, and many potential homeowners are constrained in the amount of credit they can obtain, *credit supply* ought to impact house prices.[21] Pressures on the housing market may also arise from abroad – for example, because foreign investors with abundant liquidity and a high willingness to pay acquire property in local residential markets. Nonetheless, the user cost framework can still be useful for thinking about the impact of these factors on house prices. An increase in credit availability and a loosening of borrowing constraints, for example, is likely to reduce the interest rates faced by households and push prices up.[22] And if *global factors* were to manifest as capital inflows channelled by the local banking sector through an easing of credit conditions, they would have a similar effect. Were they to result, instead, in direct property purchases by foreigners, they could be interpreted as another housing demand driver, similar to GDP or population growth.

In summary, the framework returns the following predictions regarding the sensitivity of house prices to different drivers: prices should be higher when households' disposable income and population growth are higher; lower when interest rates are higher; and higher when credit conditions loosen and the footprint of international investors is higher.

The sensitivity of house prices to drivers varies across jurisdictions depending on the structural characteristics of each economy. For example, the interest rate sensitivity of prices ought to be greater in countries where mortgages are predominantly adjustable rate rather than fixed rate. More broadly, changes in housing demand drivers should have a larger impact on house prices in countries where the price elasticity of supply is low.[23] Price sensitivities to demand drivers could also be expected to be greater in jurisdictions with tax incentives for home ownership such as tax deductibility of mortgage interest payments.

Sensitivity of residential real estate prices to drivers

This section presents the results of various empirical analyses of house price sensitivity to drivers. It shows that the predictions summarised above are broadly supported by the data, and that there is material cross-country variation in the sensitivity of prices to drivers. This section also underscores how finding consistent,

[21] Credit supply would also affect the supply of *new* housing. In that case, interest rates would affect housing supply through building costs.

[22] See K Kuttner, "Low interest rates and housing bubbles: still no smoking gun", *Williams College Department of Economics Working Paper* 2012-01, 2012 for a discussion of the credit channel in the dynamic user cost model.

[23] The price elasticity of housing supply is affected by both topographical constraints (eg the presence of mountains and large bodies of water limits the amount of land available for residential purposes) and regulatory constraints (zoning restrictions and complex planning application processes). In city centres in particular, space is relatively scarcer and construction more complicated than in the suburbs – for instance, because criteria related to building aesthetics are more demanding. See R Nijskens, M Lohuis, P Hilbers and W Heeringa (eds), *Hot property: the housing market in major cities*, Springer, 2019, and references therein.

comparable proxies for the footprint of international investment flows into residential real estate is difficult. One possible candidate – gross capital inflows – proves to be a broadly robust driver at the panel level, but not at the country level. As a consequence, results about the price impact of international investors should be interpreted as preliminary rather than conclusive.

A panel approach finds that the sensitivity of residential real estate prices to drivers is broadly consistent with theoretical predictions (Table 1). The table reports the results of a panel regression of the annual change in real house prices on lagged price growth (to account for price inertia) and various drivers.[24] Due to the difficulty of collecting consistent proxies for housing supply drivers comparable across countries, the regressions focus on demand drivers. Columns (1)–(4) consider standard demand drivers. Households' disposable income, proxied by growth in per capita GDP, is positively related to price growth, and consistently statistically significant. Population growth, by contrast, has the right sign but is not significant. Although the price/rent ratio is not thought to be a demand driver in itself, there are reasons to believe that it should be related to price growth (Section 1). The lagged price/rent ratio is found to be negatively and significantly related to current house price growth, providing some support for the backward-looking view of house prices (column (4)). Columns (5)–(6a) explore the role of credit supply, captured by a price indicator of credit conditions – mortgage rates – and a quantity indicator – mortgage loans. Looser credit conditions (ie lower mortgage rates and higher mortgage volume) have a positive impact on price growth, but only the quantity indicator is robust to the inclusion of year fixed effects (column (6a)).[25]

The relationship between price growth and global factors – proxied by gross capital inflows as a share of GDP – is found to be positive and significant across a range of specifications (Table 1, columns (7)–(8a)).[26] One advantage of using gross capital inflows as a proxy for global factors/international investors is that it should capture both direct and indirect cross-border investment in real estate; the former will usually be registered as foreign direct investment, while the latter is counted as portfolio investment. One disadvantage is that capital inflows are received by many sectors, not just real estate. Another disadvantage is that the metric does not distinguish between buying and selling activity by non-residents (see Box B for a metric that does).

[24] The group chose a specification in annual changes to avoid issues with seasonality. The same exercise was performed using quarterly changes of real prices and results were found to be robust. Using quarterly data, the Group tried with lags up to one year for all regressors. It found that no more than two lags were necessary in order to capture correlations in the data.

[25] A possible explanation for why only the quantity indicator is robust when adding year fixed effects is that several countries have implemented macroprudential measures to curb loan growth in recent years (Table 4) and the year fixed effects may be picking up the impact of these measures.

[26] Results from column (8a) in Table 1 are robust to removing countries from the sample one at a time. That said, there could be an endogeneity issue in the specification. While including a proxy for the footprint of international investors as a right-hand variable assumes that investors lead prices, the relationship could also work the other way (with low valuations attracting investors).

Residential real estate price sensitivities to drivers

Panel results

Table 1

	Only demand drivers				Including credit conditions			Including gross capital inflows			
Yoy change in real house prices	(1)	(2)	(3)	(4)	(5)	(6)	(6a)	(7)	(7a)	(8)	(8a)
House prices (*t*–1)	0.372***	0.395***	0.381***	0.397***	0.325***	0.238***	0.248***	0.285***	0.277***	0.207***	0.225***
Per capita GDP	0.885***	0.874***	0.922***	0.852***	0.707***	0.571***	0.916**	0.498**	0.785**	0.347	0.609
Short-term interest rate	–0.232***	–0.145	–0.129	–0.324***							
Term spread		0.003	0.004*	0.002							
Population growth			0.882	1.480	1.228	1.099	2.101**	0.805	2.004**	0.531	1.909**
Price/rent ratio (*t*–1)				–0.056***	–0.055***	–0.079***	–0.104***	–0.087***	–0.104***	–0.088***	–0.146***
Mortgage rates					–0.226	–0.387*	–0.190	–0.366**	–0.036	–0.327	0.113
Mortgage loans						0.317***	0.192***			0.308***	0.196***
Gross capital inflows/GDP								0.064***	0.061***	0.083***	0.077***
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year fixed effects	no	no	no	no	no	no	yes	no	yes	no	yes
Observations	728	728	727	727	506	363	363	473	473	350	350
R-squared	0.368	0.372	0.373	0.395	0.333	0.389	0.628	0.377	0.599	0.422	0.652

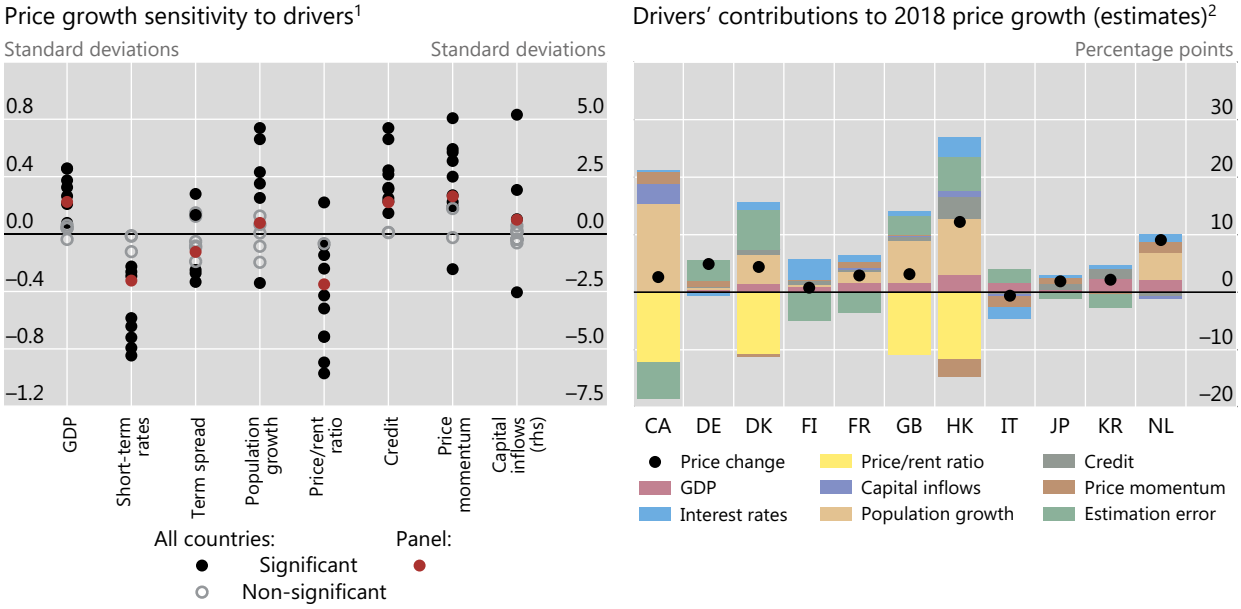
*** p<0.01, ** p<0.05, * p<0.1. *t* indicates year. Data starting in Q1 1970 and ending in Q4 2018. Coverage may vary for each country depending on data availability.

The panel results shown in Table 1 mask substantial cross-country variation in the sensitivity of residential real estate price growth to different drivers. Graph 10 illustrates this heterogeneity by displaying sensitivity estimates obtained through country-level regressions of price growth on drivers (left-hand panel).[27] For the jurisdictions in the sample, these country-level results are broadly consistent with the panel results, with the exception of the term spread and capital inflows. The term spread is found to have a positive rather than a negative impact on prices in a couple of jurisdictions. Estimates of the sensitivity of price growth to gross capital inflows display the most cross-sectional dispersion in the sample, varying within a 7.5 standard deviation range and taking both positive signs (as expected) and negative signs. This highlights some of the issues of proxying for global factors and international investors with as broad a measure as gross capital inflows.

Combining house price sensitivities with recent changes in drivers returns that population growth, price/rent ratios and interest rates account for the lion's share of contributions to price changes in 2018 (Graph 10, right-hand panel).[28] Population growth helped boost house prices in most of the jurisdictions in the sample, with

Residential property prices

Graph 10



[1] Each dot reports an estimate of the sensitivity of year-on-year growth in real prices to a particular driver of price dynamics. Price growth was regressed on real GDP, population growth, real short-term rates, the term spread, the lag of the price/rent ratio, real bank credit growth and gross capital inflows. Regressions also include an autoregressive term (price momentum). [2] The estimated contribution of driver *D* in country *i* to 2018 price growth is obtained as $C^{D}_{i,2018} \equiv \sum_{q=1}^{4} \hat{\beta}_i^D D_{i,2018q} / 4$, where $\hat{\beta}_i^D$ is the estimated sensitivity of price growth to driver *D* in country *i*. The set of countries shown in the right-hand panel is the same as that underpinning the left-hand panel. Interest rates report the sum of contributions of real short-term rates and the term spread.

Sources: National data; Study Group calculations; BIS.

[27] See Annex Table 1 for the underlying estimates. Countries were included in Graph 10 based on the goodness of fit of the specification (captured by signs consistent with those of optimal country-by-country specifications found in the literature) and availability of data (at least 60 observations).

[28] Availability of mortgage rate data varies across countries. As a result, short-term interest rates and the term spread were used in the country-level exercise.

particularly large contributions in Canada and Hong Kong (beige bars). Lower interest rates (blue bars) reinforced price growth, except in Italy. At the same time, buying a home became more expensive relative to renting in several jurisdictions, partially offsetting these pressures (yellow bars). Interestingly, capital inflows (purple bars) contributed to price growth only in Canada and, to a lesser extent, Hong Kong, and played a very limited role elsewhere.[29] Estimation errors – or the difference between actual price growth and the rate of growth predicted by the country-level regression model – were positive in 2018 in Denmark, Germany, Hong Kong, Italy and the United Kingdom (green bars). They were negative in Canada, Finland, France and Korea. That said, these results should be interpreted with caution. In order to preserve a modicum of cross-country consistency and comparability, the specification adopted for the country-level regressions is a "one size fits all" rather than a "jurisdiction-optimal" one. Predictably, there are differences in the goodness of fit of the regression model (Annex Table 1).

Cross-sectional variation in the sensitivity of residential real estate prices to different drivers can also be found within a country, with a number of factors contributing to stronger property price growth in urban areas than in other regions, including the activity of international investors (Box A).

International investors

The empirical analysis above highlights some of the difficulties with using a regression framework based on cross-country comparable data to capture the impact of international investors on local property markets. In order to address this issue, this section takes a different tack and considers the role of international investors through the lens of a number of case studies. The mix of qualitative and quantitative evidence provided by the case studies suggests that non-resident capital inflows could be playing a significant role in driving local residential real estate price dynamics in several CGFS countries.

The footprint of foreign investors in local residential real estate markets has been on the rise in recent years in a number of jurisdictions. In Singapore, foreign buyers increased from about 9% of transactions in mid-2009 to a peak of 20% in 2011. Following the implementation of a host of macroprudential measures (Section 3), their activity has since declined, to around 6% of total transactions in early 2019. Hong Kong similarly experienced a peak in the share of transactions accruing to foreign buyers in 2011 (10%), but this share has hovered below 2% since 2013. The Canadian city of Vancouver reached a peak in the international share of transactions at 15% in 2016, but again the activity of international buyers has declined to below 3%. By contrast, foreign buyers have had a smaller relative presence in Australia, where in recent years they accounted for around 5–10% of the value of transactions and perhaps about half of that in terms of number of transactions.[30]

[29] The capital inflows contribution for Hong Kong may have been inflated by the broad nature of the capital inflows measure. As mentioned in footnote 26 above, one of the disadvantages of using gross capital inflows as a proxy for the role of international investors is that this variable is not specific to property markets. In the case of Hong Kong, the majority of 2018 inflows were non-property-related. In fact, the Hong Kong Monetary Authority reported that purchases by non-local individuals/ companies accounted for only 1–2% of total housing transactions in 2018.

[30] See M Gauder, C Houssard and D Orsmond, "Foreign investment in residential real estate", Reserve Bank of Australia, *Bulletin*, June 2014.

Box A

Are big cities different?

This box briefly discusses a number of demand and supply factors that differentiate city property markets from those of the rest of the country.①

Demand for urban housing is surging globally, largely due to the lure of big cities. They are economic powerhouses and poles of attraction for the young and the highly educated, as they offer better education and job opportunities as well as greater social and recreational opportunities. Agglomeration effects enhance productivity, and hence wages, further strengthening demand.② Prices in major cities tend to function as trendsetters for the rest of the country through ripple effects.

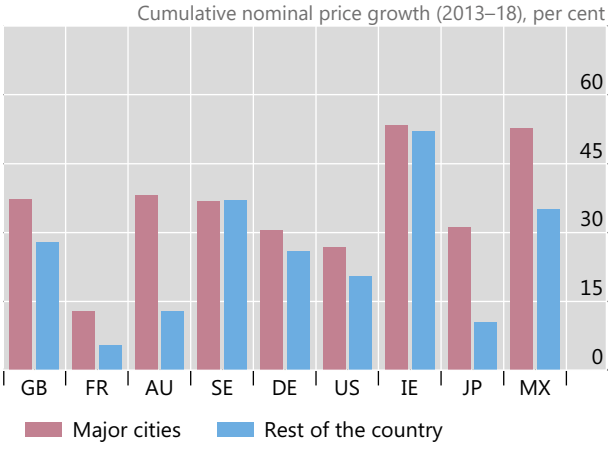
Limited elasticity in housing supply in large cities amplifies the price impact of demand pressures. Suitable land for new residential developments in city centres is scarce, owing to a mix of geographical constraints, building restrictions and resistance from incumbent residents. The planning and building process in cities can be slow and cumbersome, as it requires the involvement of many stakeholders (eg developers, different layers of public administration, residents). Finally, housing developers tend to favour the owner-occupied segment (which is more profitable) rather than target the growing demand for rented accommodation.

As a result of strong demand pressures and limited supply elasticity, property price growth can be stronger in urban areas than in the rest of the country. This was indeed the case for a number of cities – including London, Paris and Tokyo – between 2013 and 2018 (Graph A, left-hand panel). On the other hand, cities cannot outperform the rest of the country forever: the latter usually catches up, albeit with quite a lag, causing the difference in growth rates to narrow again. Urban areas also tend to see larger price swings than rural areas. In the Netherlands, for example, the Amsterdam property price index rose faster than the national index both in the pre-crisis period and during the recovery, and it dropped lower in the wake of the dotcom crisis (right-hand panel).

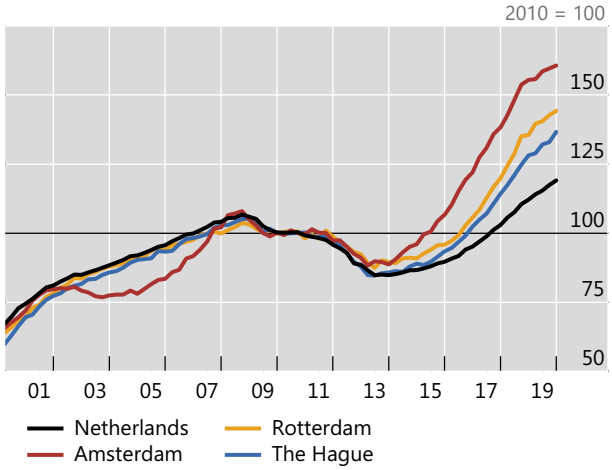
Regional differences in property price dynamics

Graph A

Regional house price differences



Residential property prices of existing own homes



For GB, London vs all dwellings; for FR, all flats in Paris vs existing flats in Paris and suburbs; for AU, simple average of Melbourne and Sydney residential property prices vs simple average of six other cities; for SE, simple average of main cities vs simple average of the rest of the country; for DE, price growth from 2015–18, seven biggest cities vs the whole country; for US, metropolitan areas vs non-metropolitan areas; for IE, Dublin vs the rest of the country; for JP, all flats in Tokyo vs all dwellings; for MX, capital city vs all dwellings.

Sources: Deutsche Bundesbank; Statistics Sweden; Datastream; Federal Housing Finance Agency; national data; BIS calculations.

With foreign investors becoming more active in large "global" cities in recent years (as discussed in the main text below), house prices in urban areas are increasingly reflecting a balance between local and global factors ("glocalisation").③ Yield-seeking investors often enter the buy-to-let market, which offers relatively high yields compared with alternatives. That said, the influence of international investors is not evenly distributed across the globe. Foreign demand contributes to housing market pressure in London, Sydney and Vancouver, but plays a less significant role in Amsterdam or Paris.④

Data issues make cross-city empirical analysis especially difficult. While city-level statistics are available for both residential and commercial real estate, they tend not to be comparable on a cross-country basis. The data are generally furnished by local, often commercial, providers. Country-level data reflect city-level developments to some extent, but local dynamics can deviate from averages (Graph A, left-hand panel).

① The box is based largely on R Nijskens, M Lohuis, P Hilbers and W Heeringa, *Hot property: the housing market in major cities*, Springer International Publishing, 2019. ② See eg E Glaeser, *Agglomeration economics*, University of Chicago Press, 2010. ③ See IMF, "House price synchronisation: what role for financial factors", *Global Financial Stability Report*, April 2018. ④ See Nijskens et al (2019), op cit.

International investors can affect property price dynamics both directly and through expectations of sustained future price growth, as underscored by the Canadian experience. House prices in Vancouver saw a large run-up prior to the introduction of an extra stamp duty on foreign buyers in 2016. Price growth subsequently slowed in the Metro Vancouver area – from a peak of 32% year on year in July 2016 to 8% in June 2017 – but not in the rest of the Canadian province of British Columbia, where no extra stamp duty was levied on non-residents. Price growth expectations among local residents also decreased in the aftermath of the policy change, going from 10% (over the next 12 months) in mid-2016 to 4% in late 2016. This suggests foreign buyers may have played a material role in house price dynamics in Vancouver, both directly and through an expectations channel. Evidence from Spain also suggests that international investors have affected price dynamics in some regions, although the effects appear to be moderate (Box B).

A possible explanation for the material impact of international investors on price dynamics – in spite of their somewhat limited footprint – is that they may have a greater willingness (and ability) to pay for property, as in the case of Singapore.[31] After controlling for factors that ensure comparison across similar units in the same time period (eg considering residential properties within the same development), foreign buyers are found to pay higher prices than residents. For relatively larger properties – those with a floor area larger than 1,500 square feet – international investors pay 10% more than local investors. For smaller properties, they pay only slightly more (2%). As future valuations tend to be anchored by previous transaction prices, the greater willingness to pay of foreign investors is thought to raise residential property prices in the city state.[32] Indeed, Singapore reports a large degree of co-movement between the share of residential real estate transactions associated with foreigners and local house prices. Regression analysis shows that a one standard deviation increase in the non-resident share of purchases increases (corresponding to about 6 percentage points) quarterly price growth by 0.5 percentage points in the private residential property market.[33]

[31] One possible explanation is that foreign investors reap (greater) portfolio diversification benefits from acquiring local real estate. Another option is that foreign investors may be able to put local assets to more productive use.

[32] Previous transaction prices are available freely and in a timely manner in Singapore, where they are routinely used for the purposes of property valuation by real estate brokers and surveyors.

[33] See IMF, *Singapore Financial Sector Assessment Program Technical Note – Macroprudential Policy*, July 2019.

Box B

International investors and residential real estate price dynamics

Evidence from Spain

Spain has experienced a rise in net housing purchases by non-residents, which climbed from less than 0.02% of the total housing stock in 2010 to around 0.07% in each of the years between 2014 and 2018. Foreign buyers, largely from high-income European countries, tend to acquire superior-quality holiday properties on the Spanish islands and the Mediterranean coast. In the coastal province of Alicante, for example, net purchases by foreign investors accounted for 2.5% of the average housing stock between 2014 and 2018, a more than elevenfold difference relative to the national average. This box presents the results of an analysis of the impact of international investors on residential property price growth in Spain (Table B).

The analysis is based on a regression of price changes on non-resident purchases and controls. Specifically, the dependent variable is growth in house prices between 2014 and 2018, measured at the province level (there are 50 provinces in Spain). The key right-hand-side variable is net housing purchases by non-residents as a share of the housing stock. Three controls are also included: changes in the unemployment rate as a proxy for the effects of the business cycle; population growth, a key demand driver; and the interaction of population growth with population density. This variable captures non-linear effects of population growth on house prices due to supply elasticity. The hypothesis is that population growth will have a bigger impact on house prices in high-density provinces, where supply is relatively less elastic. As this argument does not apply when population declines, the interaction of population growth and density is included only for provinces that experienced population increases.

The regression results suggest that non-resident investors contributed to an increase in Spanish house prices between 2014 and 2018. However, the impact is circumscribed to a small number of provinces. Table B shows that net purchases by non-resident investors have a positive and significant impact on price growth. Combining average net purchases by non-residents between 2014 and 2018 with the estimated coefficient from Table B returns that non-resident purchases contributed an average of 2.3 percentage points to price growth in this period (in the 14 provinces where net purchases amounted to more than 0.1% of the housing stock, where prices grew by 8.8 percentage points on average). Control variables, with the exception of the change in the unemployment rate, have the expected sign and are statistically significant. Interestingly, the hypothesis that the impact of population growth on house prices is bigger in provinces with high population density and positive population growth is supported by the data.

House prices and international investors — Table B

House price growth (2014–18)	(1)
Non-resident net purchases over housing stock	2.97**
Population growth	0.85**
Pop growth*population density*pop growth>0[1]	0.01***
Change in unemployment rate	–0.35
Observations	50
R-squared	0.73

*** p<0.01, ** p<0.05, * p<0.1.

[1] This variable is calculated as the product of population growth, population density (population per square kilometre) and a dummy variable equal to 1 when population growth is positive and zero otherwise.

Sources: National data; Bank of Spain calculations.

A limited elasticity of housing supply can magnify the impact of international investors on house price dynamics, as in the case of Hong Kong. In the face of a rising share of overseas buyers in the residential property market (the share peaked at 10.6% of transactions in 2011), concerns about resident housing needs in tight supply conditions resulted in the introduction of extra stamp duties and lower loan-to-value caps for non-residents. By contrast, Australia saw an increase in building activity by foreign developers alongside an upswing in foreign demand for apartments in recent years, complicating the assessment of foreign demand pressures.[34] Housing authorities in Singapore have been ramping up supply from government land sales since mid-2009, when the share of international investors in transactions began to rise.

Commercial property markets

This section begins by briefly discussing the relationship between different factors (drivers) and commercial property price dynamics from a theoretical perspective. It then moves on to an empirical analysis to assess whether these predictions are supported by the data. This econometric exercise suggests that both domestic and global factors matter for commercial real estate price dynamics.

Drivers

The framework for thinking about commercial real estate markets – the user cost model – is the same as that for residential, with the exception that the drivers are somewhat different because most commercial real estate is purchased for the purpose of generating rental income instead of for the consumption of housing services.[35] The framework links commercial property prices, the supply of commercial space and commercial rents (endogenous variables) to each other, as well as to *returns on alternative investments* (including *interest rates*), *GDP growth* (demand drivers) and *building costs* (supply drivers).[36]

Concretely, in the commercial real estate case, market forces should make investors indifferent between purchasing commercial properties and acquiring other assets.[37] In other words, commercial real estate prices should equate the returns on holding commercial property – capitalisation rates – to the risk-adjusted returns on alternative investments (eg bonds and stocks), which tend to increase with interest rates. In addition to this user cost relationship, the framework includes a "commercial space demand" relationship linking rental income to the stock of available commercial space and economic growth: as the economy expands, businesses

[34] Non-residents are subject to approval by the Foreign Investment Review Board (FIRB) to be able to acquire property in Australia. The number of residential FIRB approvals rose almost sevenfold between the second half of the 2000s and mid-2016 (when they peaked), but have declined since.

[35] See J Gyourko, "Understanding commercial real estate: just how different from housing is it?", *Journal of Portfolio Management*, vol 35, March 2009, for a discussion of this and other differences between housing and commercial real estate.

[36] Demand drivers are defined as all those factors that influence demand for commercial real estate properties to be held for investment purposes rather than end use. GDP growth affects investor demand through its relationship with rents, as discussed next.

[37] By contrast, in the residential real estate case, market forces should ensure that households be indifferent between renting and buying.

increase demand for space and rental income increases.[38] The model is completed by a supply relationship postulating that new commercial space is built when prices increase relative to the marginal cost of building.[39] It implies that commercial real estate prices increase when interest rates fall; when increases in economic activity push up rental income; and when building costs rise.

The framework can be adapted to characterise the sensitivity of commercial property prices to changes in global factors. Suppose that capital inflows into commercial property markets were large enough to make the "marginal" buyer of property a foreign rather than a domestic investor.[40] Assume also that the returns on alternative investments were relatively lower for foreign investors. Then the relevant "user cost" underpinning price adjustments would fall, and commercial property prices would have to rise for foreign investors to still be indifferent between domestic commercial real estate property and other assets.

To sum up, the framework returns the following predictions about the sensitivity of commercial real estate prices to different drivers: prices should be higher when GDP growth is higher; lower when interest rates and returns on alternative investments are higher; and higher when the footprint of international investors is larger.

The sensitivity of commercial real estate prices to drivers is thought to vary across jurisdictions depending on the structural characteristics of each economy. In particular, changes in demand drivers should have a larger impact on commercial real estate prices in countries where strict zoning regulations dampen the elasticity of supply.

Sensitivity of commercial real estate prices to drivers

This section presents the results of various empirical analyses of commercial real estate price sensitivity to drivers. The predictions summarised above are broadly supported by the data, and there is material cross-country variation in the sensitivity of prices to drivers.

A panel approach finds that the sensitivity of commercial real estate prices to drivers is largely consistent with theoretical predictions (Table 2). The table reports the results of panel regressions of the annual change in an aggregate commercial real estate price index (columns (1)–(3)) as well as in separate office (columns (4)–(6)) and retail (columns (7)–(9)) property price per square foot (PSF) indices on lagged price growth (to account for price inertia) and various drivers.[41] GDP growth is positively and significantly related to price growth, regardless of the price measure being used. While it is often assumed that investors use commercial property as an inflation

[38] Rental income is thought to be highly sensitive to economic conditions, as discussed in Section 1. Within the commercial estate markets, the sectors that are more dependent on consumer demand (lodging and retail) are relatively more sensitive to aggregate demand shocks.

[39] As in the case of residential real estate, since developers typically rely on debt financing to fund construction projects, interest rates should matter for supply of commercial space too.

[40] The marginal buyer is the buyer whose willingness to pay matters for determining prices.

[41] The analysis focuses on demand drivers, chiefly because there is very little information about construction costs and about the extent to which commercial property developers rely on credit to finance their projects. That said, a decomposition of commercial property prices performed on UK data finds that demand drivers account for a much larger share of price variation than supply drivers. If these results did hold for other countries as well, the Group would not be missing too much by concentrating on demand drivers.

Commercial real estate price sensitivities to drivers

Panel results

Table 2

	CPPI			Office PSF			Retail PSF		
Yoy change in real prices	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Real price growth (*t*–4)	0.2128***	0.2303***	0.2260***	0.0943**	0.0842**	0.0782*	0.0296	0.0164	0.0116
Real GDP growth	1.0418***	0.7414***	0.7000***						
Real GDP growth (*t*–1)				0.6957***	0.5530***	0.5180***	0.4722***	0.4527***	0.4246**
Inflation	–3.4097***	–2.3565***	–2.4896***						
Inflation (*t*–1)				–2.3109***	–1.7805***	–1.8172***	–2.0783***	–1.7514***	–1.7731***
Real short-term interest rate	–2.9636***	–1.7901***	–1.9928***						
Real short-term interest rate (*t*–1)				–1.7387***	–1.0891***	–1.1291***	–0.9814**	–0.6838*	–0.7101*
Term spread		–0.8766	–1.0059						
Term spread (*t*–1)				–1.8540***	–1.5394***	–1.4525***	–0.4782	–0.3274	–0.2474
Real stock return		0.1254***	0.1059***						
Real stock return (*t*–1)					0.0720***	0.0621***		0.0059	–0.0022
VIX median		–0.0018**	–0.0019***						
VIX median (*t*–1)					–0.0009	–0.0010*		0.0000	–0.0001
Price/earnings ratio		0.0016	0.0015						
Price/earnings ratio (*t*–1)					0.0006	0.0006		0.0025**	0.0024*
Gross capital inflows/GDP			0.1726***						
Gross capital inflows/GDP (*t*–1)						0.0849**			0.0666
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	573	573	573	981	981	981	940	940	940
Adjusted R-squared	0.289	0.485	0.499	0.185	0.241	0.246	0.048	0.055	0.058

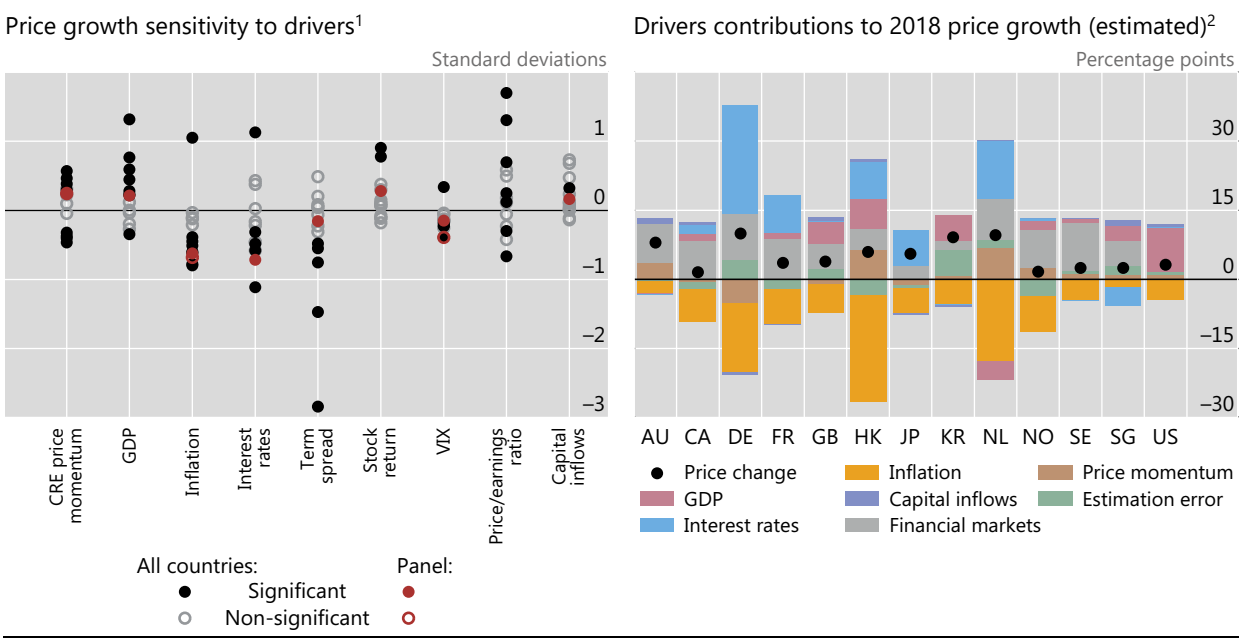
*** p<0.01, ** p<0.05, * p<0.1. *t* indicates quarter. Data starting in Q1 1960 Q1 and ending in Q1 2019. Coverage may vary for each country depending on data availability. CPPI price indices cover a smaller number of countries than PSF series. Lag structure chosen to yield the best fit according to Akaike and Bayes information criteria.

hedge, inflation is found to be negatively and significantly associated with price growth.[42] As expected, higher interest rates decrease commercial real estate prices. By contrast, higher equity returns translate into higher growth, although the relationship is neither robust nor significant for the retail market. Global factors do play a role in driving commercial property prices. An increase in the VIX "fear index" decreases growth in the aggregate commercial property price index (CPPI), indicating that price growth declines when investors become more risk-averse. Finally, there is a positive and significant relationship between gross capital inflows – a proxy for the role of global investors subject to the same caveats raised in the discussion of residential real estate dynamics – and growth in commercial real estate prices.

A country-level approach points to material cross-country variation in the sensitivity of commercial real estate price growth to different drivers.[43] Graph 11 illustrates this heterogeneity by displaying sensitivity estimates obtained through country-level regressions of price growth on drivers (left-hand panel).[44] The country-

Commercial property prices

Graph 11



[1] Each dot reports an estimate of the sensitivity of year-on-year growth in real prices (at quarterly frequency) to a particular driver of price dynamics. Price growth was regressed on real GDP, inflation, real short-term rates, the term spread, gross capital inflows, stock returns, stock price/earnings ratios and the VIX. Regressions also include an autoregressive term (price momentum). [2] The estimated contribution of driver D in country i to 2018 price growth is obtained as $C^{D}_{i,2018} \equiv \sum_{q=1}^{4} \hat{\beta}_i^D D_{i,2018q} / 4$, where $\hat{\beta}_i^D$ is the estimated sensitivity of price growth to driver D in country i. The set of countries shown in the right-hand panel is the same as that underpinning the left-hand panel. Interest rates (yellow bars) reports the sum of contributions of real short-term rates and the term spread. Financial markets reports the sum of the contributions of the VIX, the term spread, the stock return and the price/earnings ratio.

Sources: Real Capital Analytics (CPPI series); national data; Study Group calculations.

[42] N Blake, A Goodwin, A McIntosh and C Simmons, *Property and inflation*, Technical Report, Investment Property Forum, April 2011, review the literature on commercial property as an inflation hedge, and conclude there is as yet no consensus.

[43] Given the absence of harmonised national statistics on commercial real estate prices, some of the heterogeneity may be driven by data quality issues.

[44] See Annex Table 2 for the underlying estimates. Countries were included in the exercise based on data availability.

level results are broadly consistent with the panel results, although estimates of the sensitivity of commercial real estate prices to gross capital inflows tend not to be significant in the sample. Among the drivers of commercial real estate prices, the term spread is associated with the largest degree of cross-sectional variation in country-level estimates, which vary within a 3.5 standard deviation range. It is followed by stock dividend yields, with a range of three. Estimates for price sensitivity to interest rates, GDP and inflation all vary within a two standard deviation range. By contrast, estimates of commercial real estate price sensitivity to global factors – the VIX and capital inflows – are more concentrated.

Combining commercial real estate price sensitivities with changes in drivers returns that inflation, interest rates, financial markets and GDP account for the lion's share of contributions to price changes in 2018, with capital inflows playing a very limited role (Graph 11, right-hand panel). While higher inflation pushed for prices to decline in 2018 (orange bars), this effect was offset by lower interest rates (blue bars) and higher GDP growth (red bars) in most of the jurisdictions in the sample. In the Netherlands, a deterioration in other investment prospects (grey bars) contributed to further boosting prices. Differences between the actual rate of growth and that predicted by the model (green bars) were broadly positive, with the exception of France, Hong Kong and Norway.

International investors

The empirical analysis above highlights some of the difficulties with using a regression framework based on cross-country comparable data to capture the impact of international investors on local property markets. To address this issue, this section considers the role of international investors through the lens of a number of case studies. The mix of qualitative and quantitative evidence provided by the case studies suggests that non-resident capital inflows could be playing a significant role in driving local commercial real estate price dynamics in a number of jurisdictions.

The case study evidence points to foreign investors accounting for a large share of activity in commercial real estate markets, both in absolute terms and relative to residential real estate markets. In Belgium, about 50% of all investment in the commercial segment since 2013 originated abroad. The Netherlands reports a similar footprint, with the share of foreign parties in commercial real estate transactions hovering around 60% since 2014. Figures are higher still for the United Kingdom, where net investment in commercial property has been entirely driven by foreign investors since 1999. As a result, non-residents owned about 30% of the invested stock as of 2017.

The large footprint of international investors on commercial real estate activity in these jurisdictions translates into higher prices and lower valuations. In Belgium, price growth is positively correlated with the share of foreign investors in office markets (the main investment asset), even after controlling for GDP growth. This may be driven by the fact that – controlling for office location but not for quality – non-resident buyers tend to pay a higher price per square metre than domestic investors. Evidence from the Netherlands suggests that the greater willingness to pay for commercial real estate on the part of international investors could be underpinned by abundant liquidity and yield-seeking in the low interest rate environment. The panel analysis in the previous section, as well as the country regressions (Annex Table 2) point to a strong negative relationship between interest rates and Dutch, French, German and Hong Kong commercial real estate prices.

Foreign investment flows may have partly contributed to pushing valuations in the United Kingdom to unsustainable levels.[45] By contrast, despite the sizeable foreign capital inflows into US cities, there is no clear evidence that they have driven up property valuations (Box C).

Drivers and price synchronisation

International price synchronisation has been on the rise since the GFC, in both the residential and the commercial segment of real estate markets (Graphs 4 and 9, left-hand panels). This section explores the connection between co-movement in real estate prices and in their drivers. It finds a positive relationship between synchronisation in all the demand drivers and synchronisation in residential real estate prices. By contrast, only co-movement in GDP, inflation and capital inflows, respectively, appears to matter for co-movement of commercial real estate prices.

Empirical results point to a positive relationship between house price co-movement and co-movement in all key drivers of residential real estate prices in the post-GFC period. Table 3 reports the estimates obtained from the panel specification

Property price synchronisation and property price drivers — Table 3

	Residential RE	Commercial RE (CPPI)	
Property price synch	(1)	(2)	(3)
Real GDP synch	0.3031**	1.4001**	1.2178**
Real short-term rate synch	0.6692*	0.9056	1.1645
Real long-term rate synch	0.7536***	–0.6327	–0.957
Price/rent ratio synch	0.3937**		
Gross capital inflow/GDP synch	0.0020***	0.0058*	0.0061**
Bank credit synch	0.1493**		0.3907***
Stock return synch		–0.0208	0.0031
Stock price/earnings ratio synch		0.1993	0.1512
VIX median		0.0086	0.0212
CPI inflation synch		1.1866**	0.7975**
Country fixed effects	yes	yes	yes
Quarter fixed effects	yes	no	no
Observations	1040	430	430
R-squared	0.3123	0.2968	0.3624

*** p<0.01, ** p<0.05, * p<0.1.

Estimates are computed on the period since just prior to the GFC (beginning in Q1 2006 and ending in Q4 2018). Synchronisation in variable $x \in$ {prices, GDP, credit, CPI} is computed as $S^x_{i,t} \equiv 100 - \sum_{j \neq i} |g^x_{i,t} - g^x_{j,t}|$ for all quarters t, where $g^x_{i,t}$ is the year-on-year growth rate in variable x in country i, measured at quarterly frequency and expressed as a percentage. Synchronisation in the remaining variables is computed as $S^x_{i,t} \equiv 100 - \sum_{j \neq i} |\Delta^x_{i,t} - \Delta^x_{j,t}|$, where $\Delta^x_{i,t}$ is the year-on-year difference in variable x in country i, measured at quarterly frequency and expressed as a percentage. One hundred means full synchronisation. Differences in the number of observations between column (1) and columns (2) and (3) are due to the fact that there are fewer countries in the commercial real estate (RE) sample (10 vs 20 in the residential RE sample).

Sources: Real Capital Analytics; national data; BIS.

[45] See Bank of England, *Financial Stability Report*, June 2018.

$S_{i,t}^{PP} = \beta S_{i,t}^{D} + \gamma D_t + \alpha_i + \delta_t + \varepsilon_{i,t}$. Here, S^{PP} denotes synchronisation in property prices; S^{D} synchronisation in drivers; D drivers that do not vary at the country level (eg the VIX); and α and δ country and time fixed effects, respectively. The drivers are the same variables used in the panel regressions reported in Table 1 (residential) and Table 2 (commercial).[46] The sensitivities of price synchronisation to synchronisation in GDP, interest rates, price/rent ratios, capital flows and bank credit are all positive and significant, with the effect of synchronisation in capital flows much smaller than that of the other drivers (column (1)). The picture for commercial property prices is a little more nuanced. As shown in column (2), co-movement in commercial property prices is positively related to co-movement in GDP, inflation and capital inflows. By contrast, synchronisation in interest rates and in returns on alternative assets, respectively, does not appear to play a role in the co-movement of commercial prices. Neither does investor risk aversion as captured by the VIX. Interestingly, there is a significant positive relationship between co-movement in bank credit to the private non-financial sector and co-movement in commercial real estate prices (column (3)), possibly arising from a "global banks" channel.

3. Policy measures

Developments in property markets have a bearing on financial stability and are influenced by instruments related to different areas of public policy. This section reviews the channels through which property prices can affect financial stability and provides a brief overview of policies implemented in different countries to address related vulnerabilities.

Residential and commercial property price fluctuations can introduce risks to financial stability through three main channels, all operating through debt. First, loans secured with property collateral represent very large portions of bank assets. Declines in property prices represent a risk for those exposures, as they increase the probability of borrower default and reduce the recovery value on defaulted exposures, not least because liquidations further depress market values in distressed property markets. Fire sales by leveraged property investors (such as real estate investment funds) have a similar effect on property price cycles. Second, cycles in the value of property offered as collateral amplify the cycle in credit backed by property and have procyclical effects on real activity growth. Third, when property prices are high in comparison with income, borrowers tend to assume higher debt burdens that reduce their ability to respond flexibly to future income fluctuations. Evidence suggests that highly indebted consumers are more likely to cut back on consumption and investment in a slump, thus having an amplification effect on the business cycle.[47] As a result, property price dynamics are relevant for several policy areas, such as prudential policy and tax policy.

[46] This exercise focuses on the impact of synchronisation in drivers on synchronisation in property prices. In this sense, it is different from the house price synchronisation analysis in IMF (2018), op cit, which focuses instead on the relationship between price synchronisation and financial and trade openness (Annex 3.3).

[47] See also CPB Netherlands Bureau for Economic Policy Analysis, "Disentangling the effect of household debt on consumption", *CPB Discussion Paper*, April 2019.

Since the GFC, several countries have implemented macroprudential policies to bolster financial system resilience, with many focused on containing mortgage credit risk (Table 4). By and large, macroprudential measures have targeted the residential rather than the commercial real estate market, and they can be grouped into measures that are borrower- or property-based and those that are bank capital-based.

Ceilings (caps) on the ratio of the loan to the property value (LTVs) are popular tools. More than half of the countries participating in the Study Group (Canada, Hong Kong, the Netherlands, Singapore and Sweden) have taken such measures. In general, some of these countries experienced substantial price increases in the early 2000s and had very high LTV ratios during the GFC (eg >90%). Research has shown that borrower defaults tend to be more common in countries with high LTV ratios, as these reduce the financial resilience of borrowers in the face of price or income declines.[48] Lower LTV caps can thus benefit financial stability. In addition, LTV caps

Box C

International investors and commercial real estate valuations

Evidence from US cities

This box explores the impact of international capital flows on local commercial real estate property valuations by estimating a formal model of capitalisation rates (cap rates) for US cities. It finds no evidence of a strong linkage between international capital flows and changes in commercial real estate valuations.

Drawing on standard asset pricing theory, which values assets as perpetuities paying a stream of income that grows at a constant rate, the cap rate can be expressed as $X/P = r + \rho - g$. ① Here, X and P are the current period's income and the asset value, respectively; $(r + \rho)$ is the required rate of return consisting of the risk-free rate r and a risk premium ρ; and g is the per-period constant rate of expected net operating income growth. ② Increases in cap rates correspond to declines in valuations (and vice versa). Accordingly, the baseline empirical specification of the cap rate is formulated as:

$$C_t = a_0 + a_1\, r_{t-1} + a_2\ r_{t-2} + \ a_3\ \gamma_{t-1} + a_4\ \gamma_{t-2} + a_5\, v_{t-1} + a_6\, v_{t-2} + \varepsilon_t\ ,$$

where C is the capitalisation rate, r is the nominal 10-year Treasury yield, γ is nominal year-on-year office rent growth, and v is the vacancy rate, with lagged rent growth and vacancy rates generally serving as proxies for expected rental income growth. Because there does not seem to be a clear consensus in the literature on how best to measure the risk premium required by commercial real estate investors, ρ, it is not included in the baseline specification. The model is estimated over a panel of property type across 23 metropolitan statistical area (MSA) level time series. ③ The treasury rate is the only series which is at the national level, and does not vary by property type or MSA. The baseline model is then augmented with a four-quarter moving average of the share of international investors in commercial real estate transactions, using the same lag structure as the other series. The share of transactions by international investors by MSA across all types of commercial real estate (CRE) properties is also added. Given that the objective of the exercise is to test the drivers of changes and not levels of CRE prices, both the baseline model and the augmented model are estimated regressing year-on-year changes in cap rates on year-on-year changes in the drivers.④

The data suggest that international capital flows do not have a material impact on commercial real estate valuations (Table C). The results from the baseline model are as expected (column (1)). Increases in interest rates or vacancy rates drive down valuations while increases in rent growth result in increases in valuation. When changes in international capital flows are added in (column (2)), there is no perceptible change in the other drivers. The sign for the change in the share in international capital flows is negative, but the coefficient is barely significant and much smaller than for the other factors.

[48] See P Gerlach-Kristen and S Lyons, "Determinants of mortgage arrears in Europe: evidence from household microdata", *International Journal of Housing Policy*, vol 18, issue 4, August 2017, pp 545–67.

International investment flows and capitalisation rates Table C

Cap rates (yoy change)	(1)	(2)
Treasury rate (yoy change)	0.022***	0.022***
Rent growth (yoy change)	–0.012***	–0.012***
Vacancy rate (yoy change)	0.098***	0.098***
Share intl cap flows (yoy change, *t*–1)		–0.001*
Constant	–0.090***	–0.092***
R-squared	0.141	0.142
Adjusted R-squared	0.141	0.141
F-statistic	443	333.1
Standard error	0.238	0.238
Number of observations	8,069	8,068

* p<0.1; ** p<0.05; *** p<0.01.

Sources: Real Capital Analytics; national data; Federal Reserve Board calculations. Data starting in Q2 2002 and ending in Q2 2018.

① M Gordon, *The Investment, Financing, and Valuation of the Corporation*, Irwin, Homewood IL, 1962. ② J Nichols and G Elliehausen, "Is the Market for Office Properties Efficient?", *SSRN Electronic Journal*, March 2012. ③ Atlanta, Baltimore, Boston, Chicago, Dallas, Denver, Detroit, Houston, Las Vegas, Los Angeles, Miami, New York City, Orlando, Philadelphia, Phoenix, Portland, Sacramento, San Diego, San Francisco, Seattle, Tampa, Tucson and Washington DC. ④ Separate regressions, not shown, on the levels of capitalisation rates show that international investors are more likely to invest in markets with higher levels of valuation. The current specification mitigates, but does not completely address, this endogeneity.

can dampen exuberant property price growth by raising the own funds required by buyers entering the market.[49] Furthermore, in countries where banks do not have double recourse – meaning that they do not hold claims on a borrower's income or assets beyond the loan collateral – negative equity implies that banks are likely to bear losses in the event of a borrower default, as borrowers can no longer fully repay their debt by selling the property.

Income and serviceability measures are borrower-based tools that have been introduced in many countries, such as Australia, Canada, Hong Kong, the Netherlands, Singapore, the United Kingdom and the United States. These measures set minimum standards for the ability of borrowers to service their debt in the face of possible unanticipated shocks to income or expenditure in the future, thereby increasing their financial resilience. For instance, Singapore, Sweden and the United States have introduced amortisation requirements, restrictions on the availability of interest-only mortgages and loan tenure limits.[50] These reduce the likelihood that borrowers are faced with a large repayment bill at the time their mortgage matures, thereby reducing frictions in the housing market (for example, borrowers might be forced to

[49] Netherlands Bank, "Effects of further reductions in the LTV limit", *DNB Occasional Studies*, vol 13 – 2, 2015.

[50] See European Commission, "House price and indebtedness in Sweden: a model-based assessment of policy options", *Economic Brief* 021, December 2016.

sell at term). Australia introduced temporary interest-only and investor lending benchmarks, which were removed after lending standards strengthened.[51]

Several countries (Belgium, France, Hong Kong, Luxembourg, Sweden and the United States) have taken capital measures, increasing (or introducing a floor under) the risk weights on residential loans for credit institutions or activating the countercyclical capital buffer. The Netherlands is planning to increase risk weights on residential loans from 2020 onwards.

Because of leakages and spillovers, the parameters of macroprudential policy tools are especially difficult to calibrate at the city level. In addition, relatively stronger price pressures in urban areas require more stringent policy actions (ie lower LTV caps). As a result, macroprudential policies can have unintended consequences such as greater intergenerational inequality, as younger households can be pushed out of the residential property market altogether. That said, if macroprudential tools do help reduce price pressures, then they would lead to lower intergenerational inequality.

In addition to macroprudential measures, many countries have also deployed fiscal measures to limit frictions in the housing market (Table 5).[52] In the Netherlands, interest-only loans no longer qualify for mortgage interest deductibility, while in the United Kingdom mortgage interest deductibility has been reduced for buy-to-let mortgages. Spain eliminated tenants' national tax deduction for rent payments and reduced the national tax deduction for landlords. Hong Kong, Singapore and the United Kingdom have introduced or increased stamp duties for individuals buying a second home, including buy-to-let investors. Hong Kong and Singapore have introduced stamp duties on sellers, whereas in Spain, since end-2018, lenders instead of borrowers have to pay the stamp duty on mortgages.

Other countries (and cities) have taken fiscal measures targeted at international investors, possibly because these investors tend to rely relatively less on local funding, which in turn diminishes the effectiveness of domestic credit measures in containing foreign activity. Australian states, Canada (Vancouver), Hong Kong and Singapore have all either introduced or increased stamp duties, with higher rates levied on foreign buyers, thereby contributing to a reduced flow of external liquidity to local real estate markets. At the opposite end of the spectrum, countries have used fiscal tools in a way that offered support to property prices. For example, a favourable tax regime for non-residents moving to Portugal introduced in 2009 boosted housing demand and valuations.

As mentioned above, fewer measures have addressed the commercial property market. Sweden, the United Kingdom and the United States have increased the risk weights assigned to commercial real estate loans. Hong Kong tightened caps on debt service and LTV ratios for both residential and commercial property loans.

Whether the tools employed thus far will be adequate and sufficient to address the risks associated with an increased role for global factors and international investors in a number of jurisdictions remains an open question. While an assessment of different policy options is outside the scope of this report, some case studies seem to suggest that fiscal policy actions like foreign buyer taxes could be more effective

[51] See Reserve Bank of Australia, "Assessing the effects of housing lending policy measures", *Financial Stability Review*, October 2018.

[52] Other objectives, such as revenue objectives, sometimes also play a role in the activation of these fiscal measures. This was, for example, the case in Australia.

than macroprudential policy at reducing demand of foreign buyers and possibly dampening price growth (eg Canada, Hong Kong, Singapore). At the same time, it is hard to distinguish the direct effects of these actions on house prices from the indirect ones (as, for instance, the induced changes in expectations of local residents). The increased role of international investors poses new challenges for policymakers, such as possible circumvention of regulation and greater complexity of transmission channels.

Prudential measures

Table 4

	Collateral	Income/serviceability		Amortisation restrictions	Capital
	LTV	LTI/DSTI/DSR	Other		Risk weights on mortgages/CCyB
Australia		10% investor lending growth benchmark - introduced by the Australian Prudential Regulation Authority (APRA) for authorised deposit-taking institutions (ADIs) December 2014. Removed from mid-2018, subject to institutions providing APRA assurances on the strength of their lending policies and practices.	Serviceability assessments standardised across ADIs (minimum 2% interest rate buffer and 7% interest rate floor – introduced by APRA in December 2014. Interest rate floor removed and buffer increased to 2.5% in July 2019.	Limit on interest-only lending (no more than 30% of new lending) – introduced in March 2017, removed from January 2019 for those ADIs which have qualified to have the investor lending benchmark removed.	
Belgium					Five percentage point increase in risk weight for residential mortgages applicable to IRB banks – introduced in 2013, this measure was tightened further in 2018
Canada	Higher down payment requirements for insured mortgages – introduced in 2015		Affordability test: stricter mortgage qualification criteria for (un)insured mortgages – introduced in 2016 (insured) and 2018 (uninsured)		
France					Countercyclical capital buffer raised to 0.5% (2018 and 2019)
Hong Kong SAR	Lowering of LTV cap (by 10%) – introduced in 2015	Tightening of DSR limit by 10% for residential and commercial mortgages – introduced in 2015 and 2017			Raising of risk weights for residential mortgages (15% for all mortgages in 2015 and 25% for new mortgages in 2017)

	Collateral	Income/serviceability		Amortisation restrictions	Capital
	LTV	LTI/DSTI/DSR	Other		Risk weights on mortgages/CCyB
Luxembourg					STA: risk weight of 75% on the part of the mortgage loan exceeding 80% of the value of the real estate object – introduced in 2013. IRB: minimum level of 15% for the average IRB risk weight for residential mortgages – introduced in 2017
Netherlands	Stepwise decrease to 100% in 2018 – introduced in 2012	DSTI limit – introduced in 2013			Intention to increase risk weights for residential mortgages – to be introduced in 2020
Singapore	Lowering of LTV (from 90% to 80%) – implemented in 2010; lowered progressively in 2010–13 (for individual borrowers with one outstanding loan, to 50%; and for two or more outstanding loans, to 40%[1] or lower depending on loan period; for non-individual borrowers, to 20%) and in 2018 (additional 5% decrease for all borrowers)	Total debt servicing ratio framework (60%, incorporating debt servicing payments for all debt) granted for private housing loans – introduced in 2013. Mortgage debt servicing ratio (30%) for loans granted by financial institutions for public housing flats – introduced in 2013	The total debt servicing ratio framework incorporates floors under interest rates and conservatism in computing income when assessing affordability	Interest-only loans are disallowed for housing loans granted by financial institutions – introduced in 2009. Reduction of loan tenure, max 35 years for housing loans granted by financial institutions (2012), max 30 years for loans granted by financial institutions for public housing flats (2013)	
Sweden	LTV limit of 85% introduced in 2010			Introduced in 2016 for new mortgages if LTV>50–70%. Stricter requirement introduced in 2018 if LTI>4.5	Risk weight of 25% on housing loans for IRB credit institutions – introduced in 2018. Risk weights between 25% and 35% for exposures collateralised by commercial real estate, depending on property type (ie residential vs non-residential) – introduced in 2020. CCyB currently at 2.5%.

	Collateral	Income/serviceability		Amortisation restrictions	Capital
	LTV	LTI/DSTI/DSR	Other		Risk weights on mortgages/CCyB
Switzerland	January 2013: permanent increase in the risk weight for loan tranche exceeding an LTV of 80% (from 75% to 100%). July 2012: new requirements for down payment (10% of collateral value of property must be financed with own equity capital (excluding pension savings) of the borrower)			July 2012: new requirement for amortisation (mortgage needs to be paid down to 2/3 of collateral value within a max of 20 years). September 2014: tightening of amortisation requirements (mortgage needs to be paid down to 2/3 of collateral value within a max of 15 years)	February 2013 and January 2014: activation and increase of sectoral CCyB to 1% and 2%, respectively. The sectoral CCyB targets domestic residential mortgage loans
United Kingdom		LTI flow limit (mortgage lenders should not extend more than 15% of their total number of new mortgages at LTIs at or higher than 4.5) – introduced in 2014	Affordability test (when assessing affordability, mortgage lenders should apply an interest rate stress test that assesses whether borrowers could still afford their mortgages if the interest rate were 3 percentage points above the reversion rate on the loan) – introduced in 2014		Stricter criteria for the eligibility of the 50% risk weight for exposures secured by mortgages on commercial real estate – introduced in 2014
United States		DSTI limit varies by borrower and lender type		Restrictions on the use of balloon payments, negative amortisation loans and interest-only loans – introduced in 2010	Increased risk weights for CRE construction loans – introduced in 2013, revised recently

[1] An LTV limit that is 20 percentage points lower is applicable if the loan tenure exceeds 30 years (or 25 years where the property purchased is a public housing flat) or if the loan maturity extends beyond the borrower's age of 65 years.

Source: Study Group.

Fiscal measures

Table 5

	Taxes			
	Mortgage interest tax deductibility reduction	Stamp duty	Investment tax	Other
Australia		Stamp duties on non-residents (ranging 3–8%, varying by state) – introduced in 2016–19	Increase in the withholding tax rate to 30% (from 15%) on MITs to foreign investors attributable to residential housing – introduced in July 2019	
Belgium	Introduced in 2015 in Flanders (down to 40%) and in 2017 in Brussels (withdrawal of the tax deduction of mortgage loans from 2017 onwards and the (partial) offsetting thereof by a higher abatement on registration fees for all dwellings of less than EUR 500,000)			
Canada		Reduction in mortgage interest and property tax deductibility – introduced in 2018		Speculation tax of 0.5% (only in BC) – introduced in 2018. Tax on vacant homes of 1% (BC) – introduced in 2016
Hong Kong SAR		Special Stamp Duty (applicable for reselling within three years of purchase, ranging 10–20%) – introduced in 2010, tightened in 2012. Stamp duty of 15% for foreign buyers (additional to all other stamp duties) – introduced in 2012. Stamp duty of 15% on all acquisitions of residential property by individuals or companies with holdings of residential properties –introduced in 2013, modified in 2016		

	Taxes			
	Mortgage interest tax deductibility reduction	Stamp duty	Investment tax	Other
Netherlands	New mortgage loans are only tax deductible when they are amortised within 30 years – introduced in 2013. Reduction of marginal tariff at which mortgage interest can be deducted (currently 4%, to be further reduced to 37.05% in 2023)			
Singapore		Seller's stamp duty (applicable for reselling within three years of purchase, ranging from 4% (sold in third year) to 12% (sold in first year) – introduced in 2010, progressively tightened over 2010–11 and modified in 2017. Additional buyer's stamp duty (20% for foreigners; 15% for permanent residents' second or subsequent property or citizens' third or subsequent property; 10% for permanent residents' first property; and 12% for citizens' second property) – introduced in 2011, and further tightened in 2013 and 2018		
Spain		Stamp duties for lenders (instead of borrowers), varying by region from 0.5% to 1.5% of the mortgage liability – introduced in 2018		Elimination of tenants' national tax deduction for rent payments, and reduction of the national tax deduction for landlords to 60% – introduced in 2015
United Kingdom	Reduction of mortgage interest tax deductibility for buy-to-let landlords (who will be required to pay tax on entire rental income but will also receive a 20% tax relief) – introduced 2017	Increase in stamp duties for individuals buying a second property (3%), including buy-to-let investors – introduced in 2016		
United States	Reduction in mortgage interest and property tax deductibility – introduced in 2018			

Source: Study Group.

Annex 1: Country-level results

Residential real estate price sensitivities to drivers

Country level results

Annex Table 1

Yoy change in real prices	CA	DE	DK	FI	FR	GB	HK	IT	JP	KR	NL	Panel
Real GDP growth	–0.037	0.041	0.457***	0.062	0.042	0.374***	0.456**	0.327*	0.078**	0.209**	0.266***	0.224***
Real short-term interest rate	–0.585***	–0.011	–0.721***	–0.643***	–0.122	–0.792***	–0.847***	–0.014	–0.226***	–0.262*	–0.292***	–0.324***
Term spread	–0.249***	–0.272***	–0.052	0.279**	0.134*	–0.334***	0.148	–0.190	–0.084	0.125	–0.092	–0.124***
Population growth	0.431*	0.067	–0.341**	0.661***	0.352***	0.126	0.740*	0.007	0.252***	–0.196	–0.085	0.078***
Price/rent ratio (*t*–4)	–0.713***	–0.079*	–0.971***	–0.894***	–0.427***	–0.716***	0.221*	–0.066	–0.146***	–0.518***	–0.241***	–0.350***
Real bank credit growth	0.012	0.146***	0.661***	0.228**	0.250***	0.740***	0.445**	0.012	0.415***	0.313***	0.322***	0.222***
Gross capital inflows/GDP	5.204***	–0.230	–0.232	0.162	–0.382	0.653**	0.356	–2.530*	0.074	1.922**	0.089	0.628***
Real price growth (*t*–4)	0.271***	0.510***	–0.024	0.178	0.593***	0.195***	–0.245*	0.807***	0.570***	0.224***	0.401***	0.263***
Constant												0.848***
Country fixed effects												yes
Year-quarter fixed effects												yes
Observations	152	152	152	112	152	152	72	152	92	112	152	2,575
R-squared	0.251	0.849	0.614	0.705	0.683	0.681	0.596	0.592	0.963	0.546	0.728	0.471

*** p<0.01, ** p<0.05, * p<0.1. *t* indicates current year. Data starting in Q1 1970 and ending in Q4 2018. Coverage may vary for each country depending on data availability.

Source: Study Group calculations.

Commercial real estate price sensitivities to drivers

Country level results

Annex Table 2

Yoy change in real prices	AU	CA	DE	FR	GB	HK	JP	KR	NL	NO	SE	SG	US	Panel
Real price growth (*t*–4)	0.345*	–0.093	–0.367*	–0.380***	–0.403***	0.585***	–0.123	0.324**	0.578***	0.404**	0.206	0.286*	0.287***	0.226***
Real GDP growth	–0.028	0.571	0.016	0.671	2.831***	2.003***	–0.004	1.484***	–1.587	0.965***	0.348	0.992***	4.257***	0.700***
Inflation	–1.451	–3.171	–8.817***	–4.236***	–2.512***	–9.685***	–5.576	–3.704***	–10.588***	–2.855***	–2.376	–3.912	–1.872***	–2.490***
Real short-term interest rate	–0.112	–4.543**	–9.685***	–3.718***	–0.213	–7.546**	–7.502	–0.989	–6.163***	–0.317	0.045	–4.030	–1.285*	–1.993***
Term spread	0.661	–3.579**	–7.606**	–3.713***	1.772	–2.083	–15.353***	–1.903*	2.396	–0.031	–2.643*	–2.290	0.032	–1.006*
Real stock return	0.178	–0.004	–0.014	–0.059	0.336***	0.251***	0.289***	0.041	0.103	0.068*	–0.049	0.043	–0.035	0.106***
VIX median	–0.003	–0.000	0.001	0.000	–0.004**	0.003	0.001	0.002	–0.001	–0.001	–0.002	–0.002	–0.003**	–0.002***
Price/earnings ratio	0.005	0.005***	0.007**	0.005***	0.003*	0.003	0.002*	0.002	0.005**	0.005***	0.007***	0.005	–0.000	0.001
Gross capital inflows/GDP	0.780	0.236	–0.548	–0.064	0.331***	0.034	–0.156	–0.612	–0.018	0.011	0.105	0.114	0.689	0.173***
Constant														0.045**
Country fixed effects														yes
Observations	41	41	41	41	57	41	41	41	41	41	41	41	65	573
R-squared	0.758	0.663	0.671	0.826	0.851	0.793	0.884	0.684	0.914	0.815	0.788	0.796	0.839	0.518

*** p<0.01, ** p<0.05, * p<0.1. *t* indicates current quarter. Data starting in Q4 2002 and ending in Q4 2018. Coverage may vary for each country depending on data availability.

Source: Study Group calculations.

Annex 2: Case studies

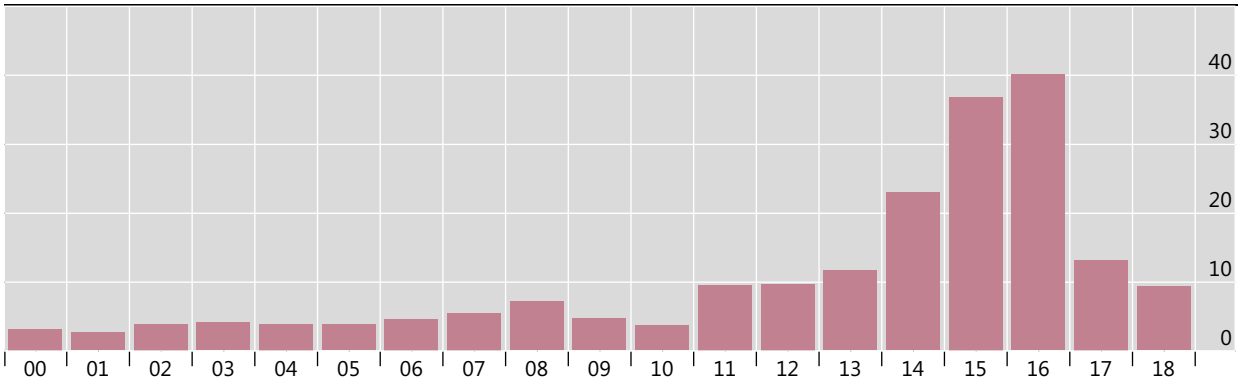
Case studies: residential real estate

Australia: International investors and international property developers

The rise and decline in demand for housing on the part of foreign residents is a demand side factor that has influenced housing prices over recent years (Graph A1). However, foreign buyers still account for a fairly small share of both the number and the value of property transactions. The upswing in demand from foreign residents in the middle of the decade also occurred alongside an increase in building activity by international property developers, which added to the supply of dwellings. More recently, these developers have scaled back their activity. The decline in foreign buyer demand partly reflects stricter enforcement of capital controls within China from late 2016, and coincided with Australian banks tightening lending availability to non-residents. It is difficult to quantify the impact of the reduction in demand on prices.

Foreign investment in residential real estate in Australia

Number of FIRB approvals, in thousands; financial year — Graph A1



Source: Foreign Investment Review Board.

In Australia, non-residents are legally able to purchase any newly constructed dwelling. In addition, temporary residents with visas that allow them to stay in Australia for a continuous period of more than 12 months (such as foreign students or people on skilled business visas) are permitted to purchase one established home provided it is used as their principal place of residence while in Australia and is sold once vacated. Foreign investors and temporary residents require approval from the Foreign Investment Review Board (FIRB) before purchasing a dwelling or site for development. FIRB approvals (total number and value) are the main source of data on the activity of foreign investors in Australian residential property markets. These data suggest that in recent years foreign buyers accounted for around 5–10% of the value of transactions and perhaps around half that in terms of the number of transactions.[53] It is difficult to measure the impact of foreign buyer demand on prices given some of the limitations of the available data. For example, FIRB approvals data

[53] See M Gauder, C Houssard and D Orsmond (2014), op cit.

are an imperfect measure of foreign buyer demand; in addition, movements in housing price indices typically reflect price changes in established dwellings while most foreign buyers purchase new dwellings.[54] There is limited information about the funding sources of foreign buyers. Reports suggest that some Chinese buyers are able to pay in full in cash. Others have been able to secure finance either through a Chinese bank in China or a subsidiary in Australia or an Australian bank/other financial institution.

The Reserve Bank of Australia's liaison with industry participants suggests that a large share of foreign activity in recent years has been for the purchase of higher-density dwellings located in inner-city areas of Sydney and Melbourne, as foreign buyers and temporary residents typically prefer dwellings close to the central business districts, major universities and public transport infrastructure. Demand from these buyers has contributed to the shift towards apartment construction, and is likely to have led to an increase in the net supply in rental apartments.

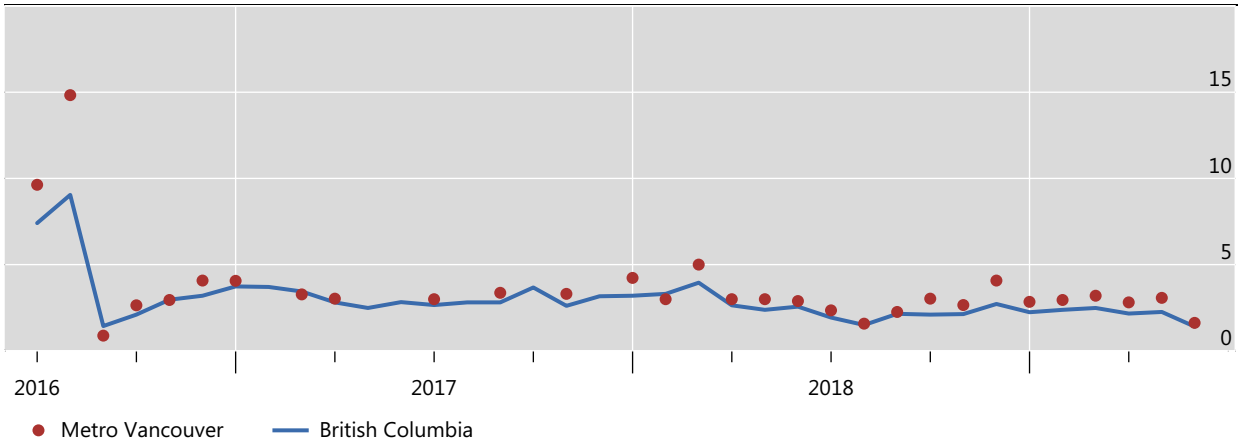
[54] FIRB data measure approvals rather than actual sales. Second, they reflect only gross approvals by foreign buyers: the subsequent sale of a property to domestic citizens or permanent residents (which is required when temporary residents leave the country) is not included in FIRB data.

Canada (Vancouver): Impact of foreign investors on price expectations

Vancouver has been widely regarded as a city attracting significant foreign investment in residential real estate. As a result, in mid-2016 the British Columbia (BC) government began publishing monthly data on the share of transactions attributable to individuals who are not citizens or permanent residents of Canada. These data showed foreign buyers accounting for roughly 10% of new sales in Metro Vancouver (Graph A2). Shortly thereafter, BC imposed a 15% tax on foreign buyers in Metro Vancouver. Due to a lag between the announcement and implementation of the tax, the share of foreign buyers temporarily spiked to about 15% just prior the tax going into effect. Once the tax was in place, however, the foreign buyer share fell to almost 0%. It has since persistently remained below 3%. Note that in 2018 the tax was increased to 20% and its geographical coverage was extended as well.

Share of foreign registrations in Metro Vancouver

In per cent — Graph A2



Source: BC Ministry of Finance.

The data show that (i) foreign buyers accounted for a non-trivial share of home purchases in Vancouver and (ii) the introduction of a foreign buyer tax effectively eliminated this source of housing demand. But just how important have foreign buyers been for house price dynamics? One way to infer this is to look at FSA-level (the area defined by the first three digits of the postal code) house price data and distinguish between areas within BC that were subject to the tax and those that were not.

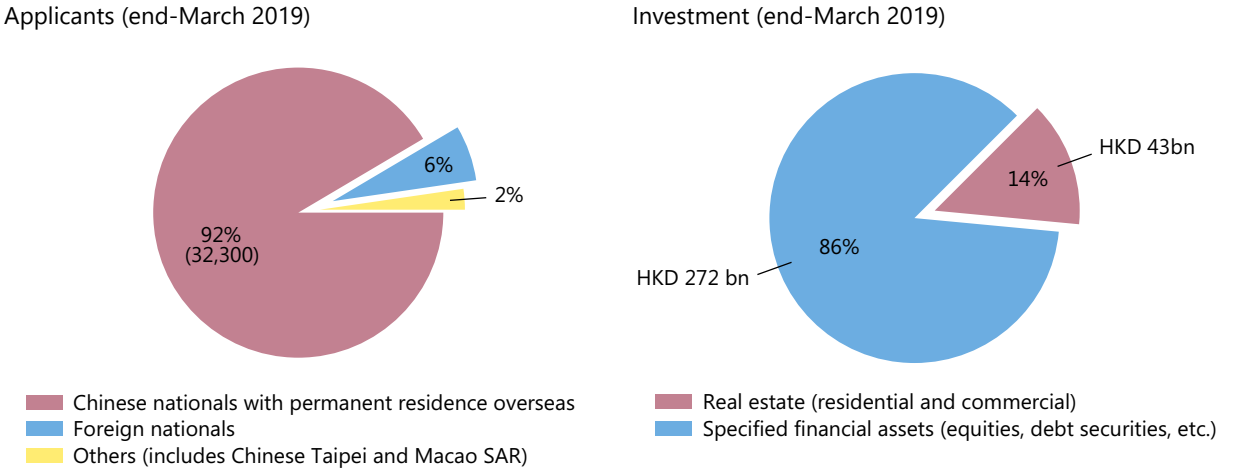
Areas subject to the tax saw a large run-up in house price growth prior to the implementation of the tax, followed by a pronounced decline. In contrast, these dynamics were not present in areas not subject to the tax. This suggests foreign buyers may have played a material role in house price dynamics in Vancouver.

An important caveat, however, is that the foreign buyer tax also altered the house price expectations of local residents. This is likely to explain why housing market activity in Vancouver fell by orders of magnitude greater than the share of buyers directly subject to the tax. This, of course, would also have influenced the subsequent decline in house price growth.

Hong Kong: Impact of international investors magnified by inelastic supply

As a well-established international financial centre, Hong Kong does not have any restriction on capital flows. International investors play a role in local asset markets, including the residential property market. Confronted with the outbreak of SARS and recession in 2003, the government implemented the Capital Investment Entrant Scheme (CIES) in October 2003 to attract new capital investment to stimulate economic growth. The scheme allows overseas investors to obtain permanent residence by investing in real estate without engaging in any business in Hong Kong. Graph A3 sheds some light on their characteristics and investment preferences.

CIES formal approval cases: applications and real estate investment — Graph A3



Sources: Hong Kong Immigration Department; HKMA calculations.

The majority of CIES applicants are Chinese nationals with permanent residence overseas (Graph A3, left-hand panel), and they have invested a total of HKD 43 billion in real estate (right-hand panel). Before the exclusion of real estate investment from CIES in October 2010 (see below), more than 90% of real estate investment under CIES was in luxury residential properties with an average value of around HKD 10 million (this accounts for only around 1% of the value of total real estate transactions).[55] Successful CIES applicants who were not investing in real estate were also likely to purchase residential properties afterwards given their need for residence.[56]

Foreign demand for residential property in Hong Kong started rising in the aftermath of the GFC (Graph A4, left-hand panel). This increase was accompanied by a rise in the share of Chinese buyers in the luxury market, which peaked at 25% in Q3 2010 (Graph A4, centre panel).[57] Residential property prices in the luxury market also grew faster than in the mass market during the same period (right-hand panel).

In view of the perception that CIES investment might have fuelled property prices, a host of policy measures were introduced beginning in late 2010. Real estate

[55] The figures related to CIES residential property investment are as of March 2010 and collected from "LCQ12: Capital Investment Entrant Scheme", https://www.info.gov.hk/gia/general/201005/05/P201005050218.htm.

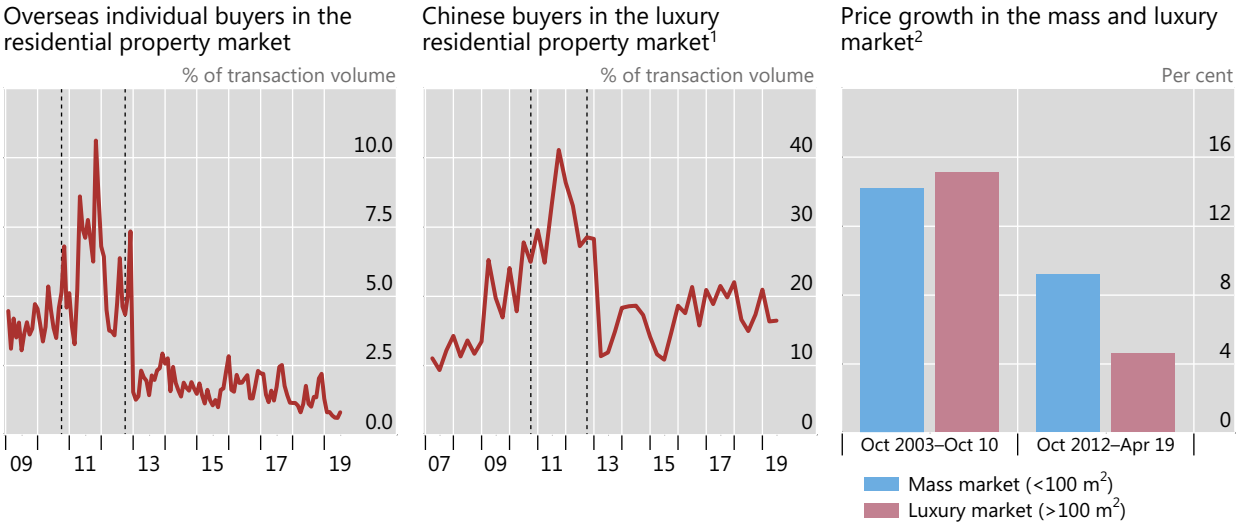
[56] "Review of the Capital Investment Entrant Scheme", Legco Council Brief, https://www.legco.gov.hk/yr10-11/english/panels/se/papers/ se1019-sbcr110209199-e.pdf.

[57] Flats whose values are above HKD 12 million or whose size is above 100 square metres are considered to be luxury flats.

investment was excluded from CIES in October 2010. In June 2011, the Hong Kong Monetary Authority (HKMA) lowered the cap on LTV ratios for borrowers whose principal income is derived from outside Hong Kong.[58] However, given abundant global liquidity and large capital inflows into Hong Kong after the GFC, these measures did not help much in curbing the demand from overseas investors. The share of overseas buyers in the residential property market climbed further to over 10% in Q3 2011 (Graph A4, left-hand panel).

In view of continued strong demand from foreign investors, a new round of measures was implemented in late 2012. To prioritise the housing needs of Hong Kong permanent residents (HKPRs) in a tight supply situation, the government introduced a Buyer's Stamp Duty (BSD) in October 2012. In particular, non-HK permanent residents and corporate buyers are taxed at a flat rate of 15% on all residential properties acquired, on top of existing stamp duties if applicable. At the same time, the HKMA further lowered LTV caps for borrowers whose principal income is derived from outside Hong Kong.[59] In the period since then, the share of overseas buyers in the residential property market has significantly declined, from around 5% in Q3 2012 to less than 1% in Q1 2019 (Graph A4, left-hand panel). In the luxury segment, the share of Chinese buyers decreased to about 15% in Q1 2019 (centre panel). The price growth of luxury flats was also slower, compared with flats in the mass market (right-hand panel).

International investors and residential real estate markets in Hong Kong SAR — Graph A4



The dashed lines in the left-hand and centre panels indicate the "suspension of real estate investment" (October 2010) and the "introduction of the Buyer's Stamp Duty" (October 2012).

[1] Residential properties with a value exceeding HKD 12 million are considered luxury flats. Chinese buyers are identified based on their pinyin names (an unpopular romanisation naming system in Hong Kong SAR) rather than their residence or statehood. Some foreign investors (eg American-born Chinese) who have pinyin names are possibly also included. [2] Annualised growth.

Sources: Centaline Property Agency; Inland Revenue Department; Rate and Valuation Department; HKMA calculations.

[58] In particular, the applicable maximum LTV ratio shall be lowered by at least 10 percentage points regardless of property types or values if the principal income of the mortgage loan applicant is not derived from Hong Kong.

[59] In September 2012, the HKMA introduced a fifth round of macroprudential measures. The maximum LTV applied to borrowers with multiple properties under mortgage is 20 percentage points lower (instead of 10 percentage points lower) if their principal income is derived from outside Hong Kong.

Singapore: International investors could influence the broader property market

The Singapore residential property market comprises a public housing market and a private housing market. While public housing is open only to Singapore citizens and permanent residents, the private housing market is not subject to ownership restrictions, and is driven by market conditions. Singapore has remained attractive to global talent over the years. International buyers are thus players in the private housing market in Singapore, alongside citizens and permanent residents.

The private housing market has significant financial stability implications for Singapore, as more than half of banks' housing portfolios are loans extended for private housing units. Further, given the interconnectedness between the private and public housing segments, pressures on private housing prices – including from speculators and non-resident buyers – can transmit to public housing prices.

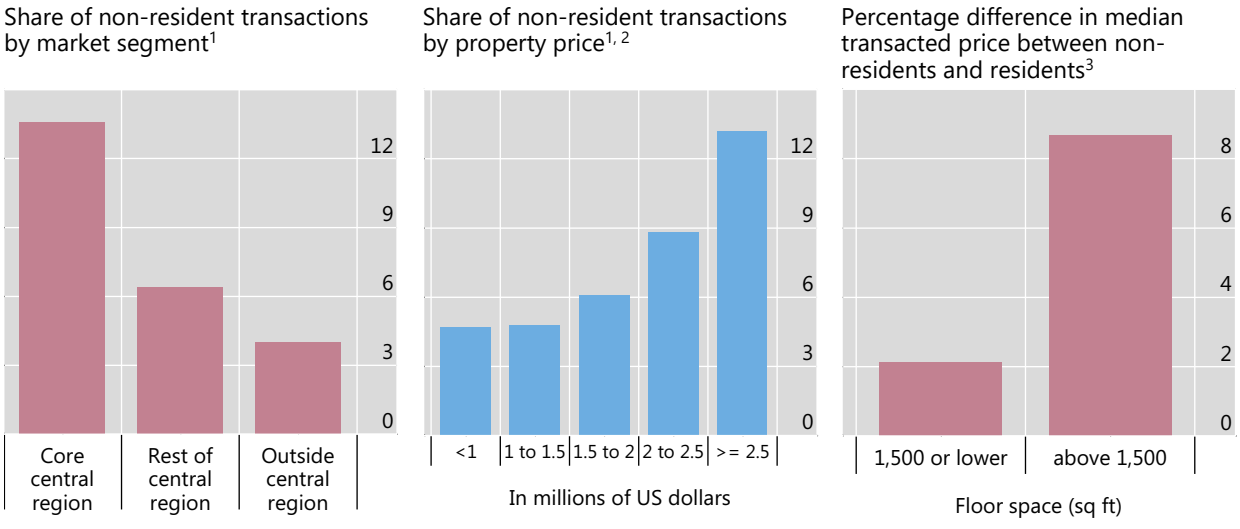
Analysis by the Monetary Authority of Singapore (MAS) found that non-residents tend to buy residential properties in the core central region (the city centre), where property prices are higher than in other regions (Graph A5, left-hand and centre panels). However, an increase in core central-region property prices could lead to spillovers given the close proximity of the different areas and Singapore's small size.

The combination of Singapore's small geographical size and a large pool of global liquidity means that demand from non-residents can have an outsized impact on activity in the market. There are signs that non-residents pay higher prices for units in the same residential development, after controlling for factors that ensure comparison across similar units in the same time period (Graph A5, right-hand panel).

This suggests that non-residents tend to pay more for similar units, and could set benchmark market clearing prices. As future prices tend to be anchored by previous transaction prices (which are available freely and rapidlly online in Singapore and are used by valuation agents and real estate agents), the marginal buyer can have an impact on market valuations, and drive price increase. Accordingly, the higher prices paid by non-residents tend to influence the broader property market.

International investors and residential real estate markets in Singapore

In percentage points — Graph A5

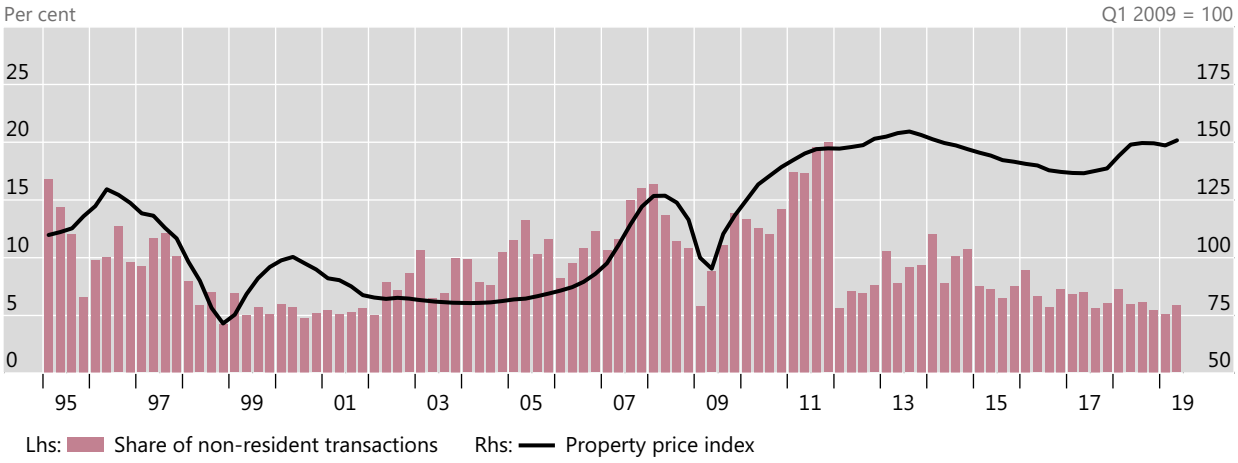


[1] From Q3 2016 to Q2 2018. [2] Actual growth in 2018 less forecasts made in July 2018. [3] From Q3 2017 to Q2 2018.

Sources: Singapore Urban Redevelopment Authority; MAS calculations.

Indeed, an increase in private residential property prices in Singapore has tended to coincide with a rise in the non-resident share of demand, both pre- and post-GFC (Graph A6). From 2004 to 2008, private residential prices in Singapore rose by 58%. The non-resident share of transactions rose from 10% to 16% in the same period. By contrast, during the GFC, a decrease in private residential prices coincided with a decrease in the non-resident share: prices fell by 25% between Q2 2008 and Q2 2009, while the share of transactions involving non-residents decreased from 14% to 9%. Private residential prices picked up again in the post-crisis period, rising by almost 55% between 2009 and 2011. Non-resident activity also grew in this period, with the non-resident share reaching a high of 20% in 2011.

Non-resident demand and private residential property prices in Singapore — Graph A6



Source: MAS.

Regression analysis confirms that private residential prices are significantly related to non-resident purchases.[60] Specifically, the results indicate that non-resident purchases are positively related to the growth of private residential prices, and the effects economically significant, with a one standard deviation increase in the share of non-resident purchases (+5.9 percentage points) associated with an increase in the quarterly growth of private residential prices of 0.5 percentage points. Further, the causality runs from transactions to prices, and not the other way around.

In response, Singapore authorities implemented several rounds of macroprudential and fiscal measures, which are thought to have dampened non-resident demand for private housing and prices. These measures included an Additional Buyer's Stamp Duty (ABSD) imposed on investors in residential property (as opposed to owner-occupiers), tiered by the number of properties already owned by Singapore residents.[61] A higher stamp duty was applied on non-residents.[62] As the ABSD took effect, the foreign share of transactions fell to single digits, a decline corresponding to a slowdown in price growth.

[60] IMF, "Singapore Financial Sector Assessment Program Technical Note – Macroprudential Policy", *IMF Country Report* no 19/227, July 2019.

[61] The ABSD was applied to both Singapore citizens and permanent residents, as well as non-resident buyers. That said, stamp duty rates for citizens were tiered according to the number of properties already owned by the buyer (eg a Singapore citizen purchasing a third property would pay higher stamp duties than one buying a second property).

[62] A higher stamp duty was imposed on non-residents on account of the possibility that domestically based credit measures would not be effective in curbing non-resident demand, given the multiple sources of funding available to international investors.

Spain: International investors buy superior-quality holiday properties

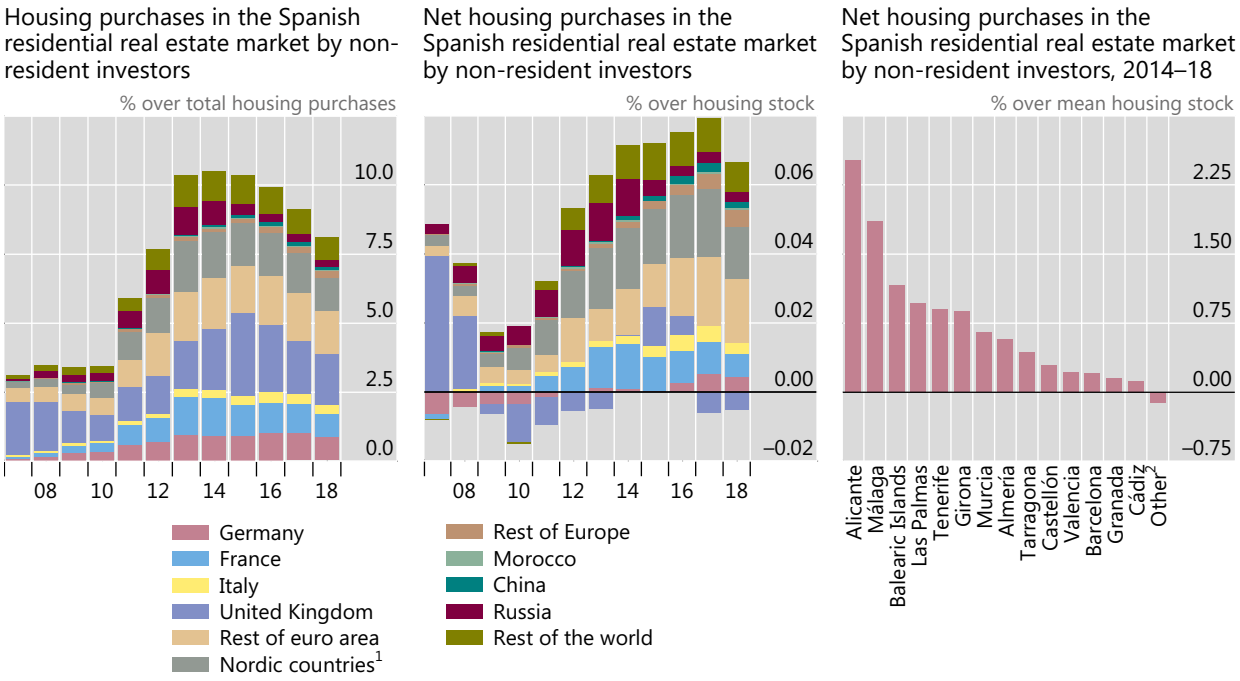
The share of purchases by international investors in the Spanish residential real estate market grew from 3% in 2007 to around 10% in 2014.[63] Thereafter it fell gradually, to 8% in 2018 (Graph A7, left-hand panel). Gross non-resident house purchases might not entirely capture the impact of international investors, as they do not consider sales. Therefore it is also helpful to consider an alternative indicator of the activity of non-resident investors, defined as net purchases (purchases minus sales) over the housing stock. This indicator has been in positive territory since 2007, meaning that the share of non-residents in the housing stock in Spain showed an upward trend during this period (centre panel). Net investment by non-resident investors was especially significant in the most recent period, with yearly net purchases accounting for around 0.07% of the housing stock between 2014 and 2018.

European high-income countries, such as France, Germany, the Nordics and the United Kingdom, account for the highest relative shares of gross purchases (Graph A7, left-hand panel). Net non-resident investment also tends to originate in European high-income countries, although some of those jurisdictions showed negative net housing purchases at some point between 2007 and 2018 (centre panel). A case in point is the United Kingdom in 2009–13 and 2017–18. The depreciation of sterling and – more recently – Brexit concerns might have played a role in these developments.

Non-resident investors rely less on Spanish banks to fund their house purchases in Spain compared with resident investors. This could indicate that they fund the transactions either with equity or through recourse to foreign banks.

International investors and residential real estate markets in Spain

Graph A7



[1] Denmark, Norway and Sweden. [2] Sum of other provinces below the threshold of 0.1%.

Sources: General Council of Notaries; Ministry of Public Works and Infrastructure; Spanish Statistical Office.

[63] Only transactions by natural persons are considered in this case study.

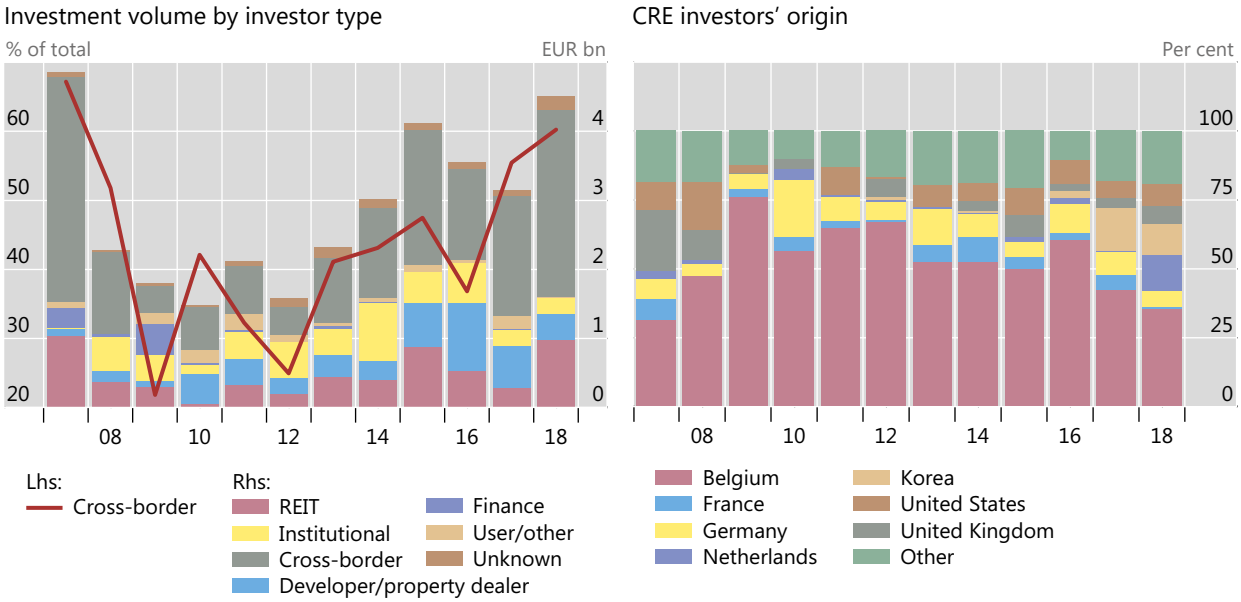
Non-resident housing purchases are concentrated in the islands and Mediterranean coastal provinces (Graph A7, right-hand panel). Average house prices paid by non-resident investors in these areas were around 40% higher than the average prices paid by resident investors between 2014 and 2018. In turn, this suggests that, on average, non-resident investors acquire superior-quality properties in the prime areas in these provinces.

Case studies: commercial real estate

Belgium: International investors tend to pay more for office space (adjusting for location)

The Belgian commercial real estate (CRE) market is small, both in absolute terms as well as relative to other European markets. The market value of CRE acquired for investment purposes was estimated to be 11% of GDP at end-2018, below the EU average (15%) and levels in neighbouring countries (NL, 19%; FR, 16%). Investment volume has, however, grown significantly since 2010, with the value of transactions reaching EUR 4.5 billion in 2018, a level close to that observed in 2007 (Graph A8, left-hand panel).

Investors in Belgian commercial real estate — Graph A8



Sources: Real Capital Analytics; National Bank of Belgium calculations.

The composition of investors has also changed since the GFC. The main domestic players, which tend to be real estate investment trusts (REITs), have gradually reallocated part of their portfolios towards neighbouring countries, targeting assets with better returns than domestic equivalents (Graph A8, right-hand panel).[64] At the same time, the share of foreign investors has increased. Foreign investors – primarily from Germany, the United Kingdom and the United States – have accounted for almost 50% of total CRE investments in Belgium since 2013. In recent years, investors from the Netherlands and Asia (eg Korean institutional investors in prime location office space) have also entered the Belgian CRE market.

Relative to domestic investors, foreign investors in the Belgian CRE market are generally involved in larger-scale deals, seek higher yields, and invest mainly in the prime office and retail segments. Foreign buyers tend to be institutional investors –

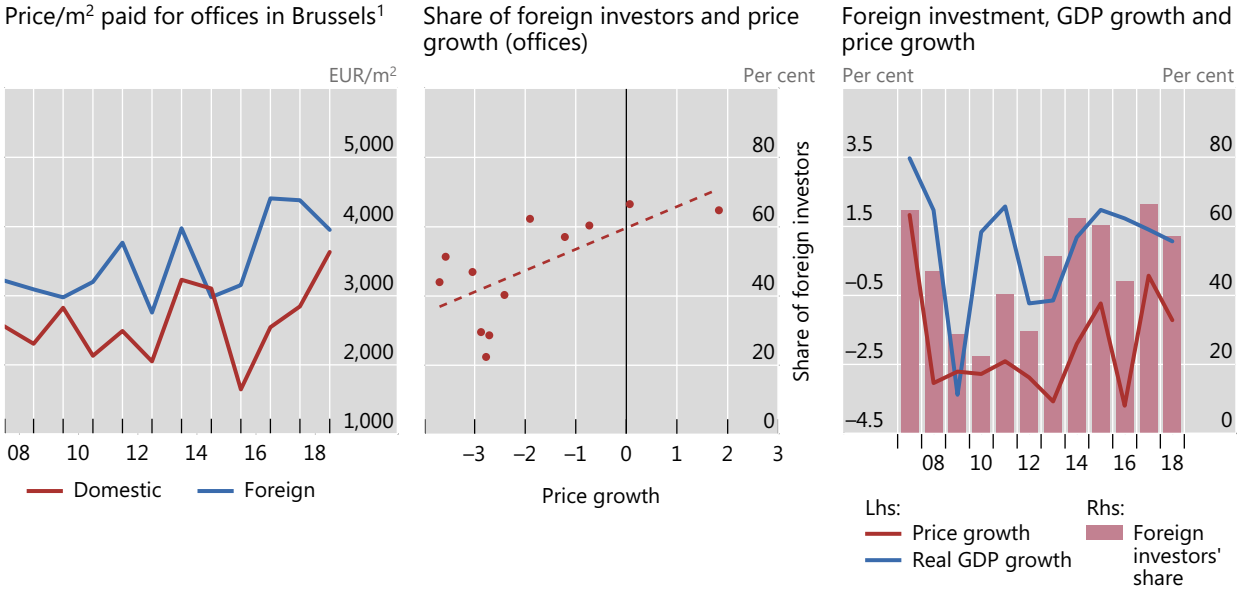
[64] For instance, the Netherlands for industrial and logistical buildings, and Germany for housing for the elderly.

investment funds, in particular. These investors tend to rely on market funding rather than bank funding, and exhibit a range of liquidity preferences depending on fund type.

Time series on investor origin are still too short to empirically assess the impact of foreign investors on Belgian CRE prices (available since 2007). That said, there are indications of a possible link, at least in the office segment.[65] Controlling for location, foreign investors have been paying a consistently higher average price per square metre for offices – the main investment asset in the Belgian CRE market – than domestic investors in the period since 2007 (Graph A9, left-hand panel).[66] Office prices are positively correlated with the share of foreign investors (centre panel). The correlation is robust to controlling for GDP growth (right-hand panel). In years such as 2010 and 2016, when higher or stable GDP growth should have implied higher/stable growth of office prices, price growth was very negative, possibly due to a lower foreign share.[67] By contrast, the stronger price growth observed in 2017 despite weaker economic growth may be due to the higher – in fact, highest ever recorded – foreign share in office investment.

Impact of foreign investors on office price growth in Belgium

Graph A9



[1] Prices refer to transaction prices for the office market in the Central Business District of Brussels, and sometimes reflect very few transactions. They should not be considered as price indices.

Sources: Eurostat; MSCI; Real Capital Analytics; National Bank of Belgium calculations.

65 Retail prices do not appear to be correlated with the share of foreign investors in Belgium. Other – difficult to quantify – factors may have come into play (terrorist attacks in Brussels, emergence of e-commerce).

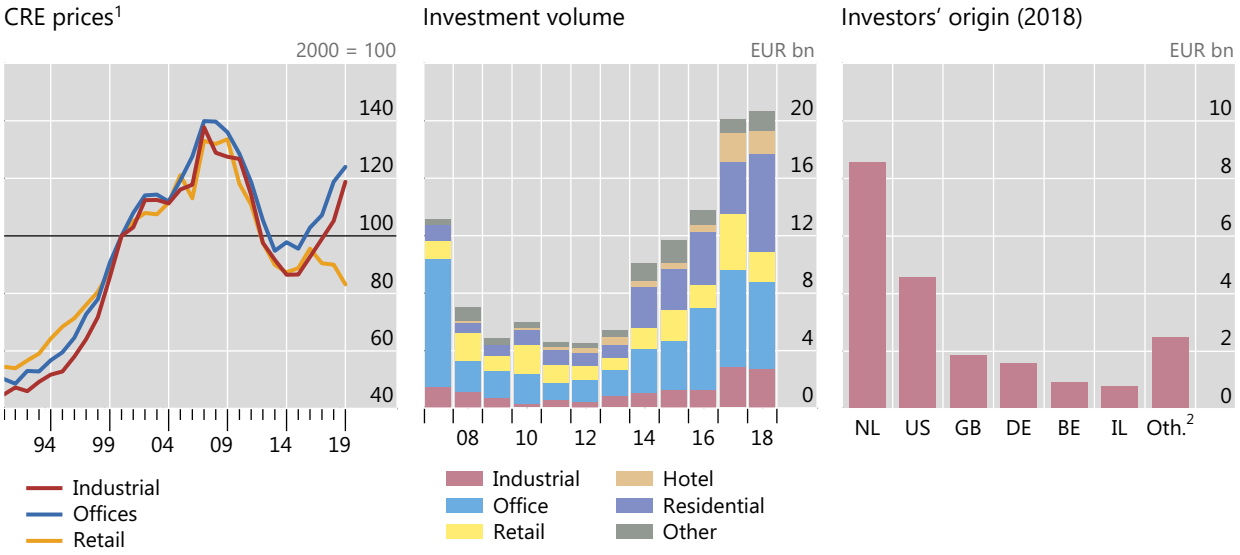
66 In this case, offices located in the Central Business District of Brussels. Data on other possible driver of the price differential – building quality – are not available.

67 Considering lagged GDP growth, this reasoning would hold true only for 2016.

Netherlands: International investors have a large footprint, but bank exposures are limited

While prices of Dutch real estate plummeted by over 30% during the GFC, they have been rising again in the past few years, particularly in the industrial and office segment (Graph A10, left-hand panel). As rental income growth is still lagging behind price growth, prime yields have dropped to record lows. There are large regional differences in the commercial real estate market, with half of all new office floor surface rented out in 2018 located in the five major cities (Amsterdam, Rotterdam, The Hague, Utrecht and Eindhoven).

Foreign investors and commercial real estate in the Netherlands — Graph A10



[1] Data for 2019 refer to the first half of the year. [2] All other investments lower than EUR 0.5 billion.

Sources: Amsterdam School of Real Estate; CBRE; Netherlands Bank calculations.

Price growth and yield compression are driven by low interest rates and the resulting search for yield. Regression analysis shows a strong negative relationship between (short-term) interest rates and Dutch CRE prices (Annex Table 2). Search for yield in the low interest rate environment has resulted in above-average demand for commercial real estate and record volumes of investment transactions. According to CBRE, a real estate adviser, over EUR 20 billion in Dutch real estate changed hands in 2017, a 40% rise on the year before (Graph A10, centre panel). In 2018, transaction volumes were even higher, while 2019 (not reported) looks to be somewhat more muted.

Foreign investors have accounted for more than half of Dutch CRE transactions in recent years, with the foreign share of transactions hovering around 60% since 2014. International investors hail mainly from the United States, the United Kingdom and Germany (Graph A10, right-hand panel). Occasionally, French, Belgian, Chinese and Scandinavian investors secure a large deal in the Dutch CRE market. These foreign parties are largely equity-funded. When they are debt-funded, their funding source is often foreign as well, with Dutch banks hardly involved.

Both domestic and foreign investors are increasingly moving away from office towards residential real estate, particularly prime locations in the Randstad

conurbation (ie Amsterdam). That said, more peripheral regions are increasingly attracting foreign inflows into housing and, to a lesser extent, logistics. The German asset manager Patrizia has invested over EUR 2.1 billion in Dutch CRE (mainly housing). Swedish property investor Heimstaden acquired nearly 10,000 Dutch homes at EUR 1.4 billion in March 2019. US private equity firm Blackstone has recently expanded its Dutch CRE portfolio beyond (prime) offices by venturing into logistics and residential real estate.

Large Dutch banks have scaled back their exposures to commercial real estate and have improved their risk management in the aftermath of the GFC. The three largest Dutch banks have an aggregate CRE balance sheet exposure of around 4% of total assets, which is below pre-crisis levels. Indirect exposures to CRE serving as loan collateral are somewhat larger, at about 9% of assets.

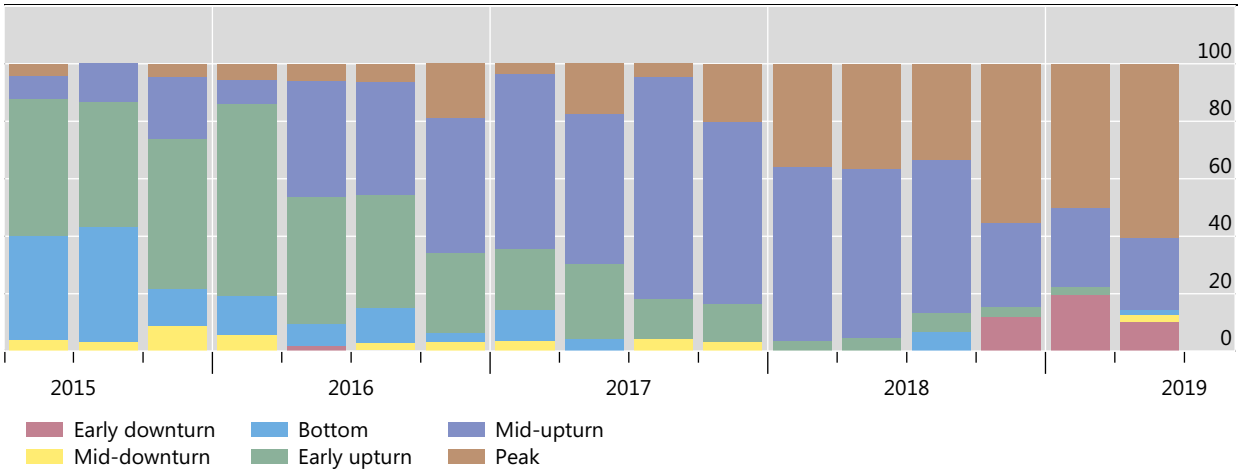
Real estate lending has shifted from Dutch banks to non-banks and foreign banks, with insurance companies, hedge funds and real estate funds providing more real estate financing lately. The result is a more uniform risk distribution among lenders, so that potential losses will not be borne by Dutch banks only. However, non-banks and foreign banks may be prone to taking larger risks, as they have less knowledge of the Dutch CRE market. They may also be more likely to withdraw when the cycle turns.

According to market participants, the Dutch real estate cycle is nearing a peak. Survey evidence suggests that more than half of investors believe the real estate cycle to be currently peaking, while 10% believe that it is in the early downturn phase (Graph A11). There are signs that vulnerabilities may have been building up in the mid-upturn phase, with market participants indicating that they now apply less stringent financing conditions and lower redemption requirements. Average LTV

Dutch market participants' perceptions of the state of the real estate cycle

In per cent

Graph A11



Source: Royal Institute of Chartered Surveyors.

percentages on newly issued real estate loans have risen relative to 2016, although they appear to have stabilised somewhat over the past year.[68] Netherlands Bank scenario analysis suggests that these vulnerabilities could result in material losses for Dutch banks in a downturn.[69] That said, banks currently have sufficient capital buffers to absorb such losses.

[68] These findings are consistent with research showing that that CRE loans issued in boom periods have a higher likelihood of default and lead to larger losses. See D Mokas and R Nijskens, "Credit risk in commercial real estate bank loans: the role of idiosyncratic versus macro-economic factors", *DNB Working Papers*, no 653, August 2019.

[69] In a scenario featuring a 3 percentage point interest rate increase, a 25% real estate price decline and a 10% increase in the vacancy rate, Dutch banks could lose EUR 1–1.5 billion on top of their current loan loss provisions. See Netherlands Bank, *Overview of Financial Stability*, Spring 2019.

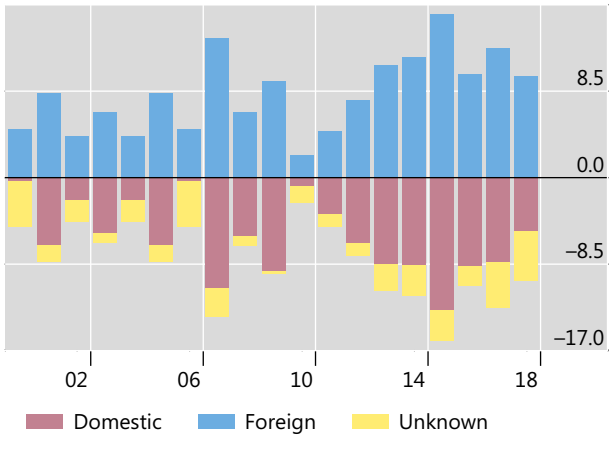
United Kingdom: Foreign investors play a large role in commercial real estate valuations

Net investment in UK commercial property has been entirely driven by foreign investor inflows since 1999 (Graph A12, left-hand panel). Foreign investors accounted for 30% of invested UK CRE stock at end-2017. Foreign investors typically purchase higher-value prime properties with low yields – especially London offices. This preference is likely to reflect a desire for UK assets and the relative returns of property vs global bonds. The average deal size of foreign investors is six times that of domestic investors, and the average initial yield is 80 basis points lower.

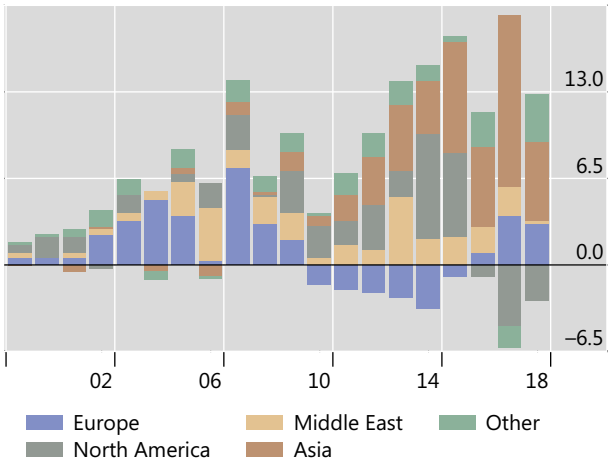
Foreign investors and United Kingdom commercial real estate

In GBP billions — Graph A12

Annual foreign and domestic net investment in United Kingdom property



Annual net foreign flows by region



Source: Property Market Analysis LLP.

Foreign flows underpin the level of valuations in UK CRE, which appear stretched in some segments. Foreign investor preference for London office space and high-value low-yield assets has partly contributed to lower yields and pushed some valuations above sustainable levels.[70]

Foreign investor activity has reduced the presence of domestic investors in the London market, diverting them to other UK regions. Since 2016, domestic investors have sold GBP 15 billion (net) of central London property to foreign investors. There is also active trading of London properties between foreign investors. Between 2016 and 2018, 42% of all central London transactions were between foreign investors.

Although the flow of investment into UK property has been consistent, the source of these funds has changed. Pre-GFC, foreign investment was dominated by inflows from Europe. North American inflows picked up following the GFC, but these flows have fallen since the Brexit referendum in 2016. This has been more than offset by increased investment from Asia (Graph A12, right-hand panel).

Since the referendum, foreign flows into UK CRE have remained resilient. In 2018, London received more foreign inflows than any other major global city and accounted for 50% of transactions. But foreign flows weakened over 2019 and were the lowest since 2011.

[70] See Bank of England (2018), op cit, p 27.

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