



Economic Commentary

Financial stability risks following reduced demand for offices

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Economic Commentaries

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Summary

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The commercial real estate sector represents a substantial share of the banks' lending and of the outstanding volume of corporate bonds. In the past few years, the debts of real estate firms have grown rapidly. These large and fast-growing debts make real estate firms sensitive to shocks that could affect their creditworthiness and ability to repay their loans. The considerable debts of real estate firms could also cause problems in the real estate sector to quickly spread to the financial system and threaten financial stability.

Offices make up a substantial proportion of the commercial real estate sector. The coronavirus pandemic has brought about new behaviours and preferences, one being that many people that have had the possibility to work from home, have done so to a much greater extent. If these preferences persist, demand for office space could decline. This study looks at the implications that reduced demand for offices, through higher vacancies and declining real estate values, could have for real estate firms and ultimately for financial stability.

The findings of the study suggest that increased teleworking as an isolated event could generate slight effects for financial stability. However, a scenario in which office space is rationalised and vacancies increase a lot can have greater consequences.

There are also other factors that could alleviate or aggravate the implications for the real estate firms in a scenario of reduced demand for office space. One example is rising interest rates, which could aggravate the negative implications for financial stability. However, the analysis of these other factors does not fall within the scope of this economic commentary.

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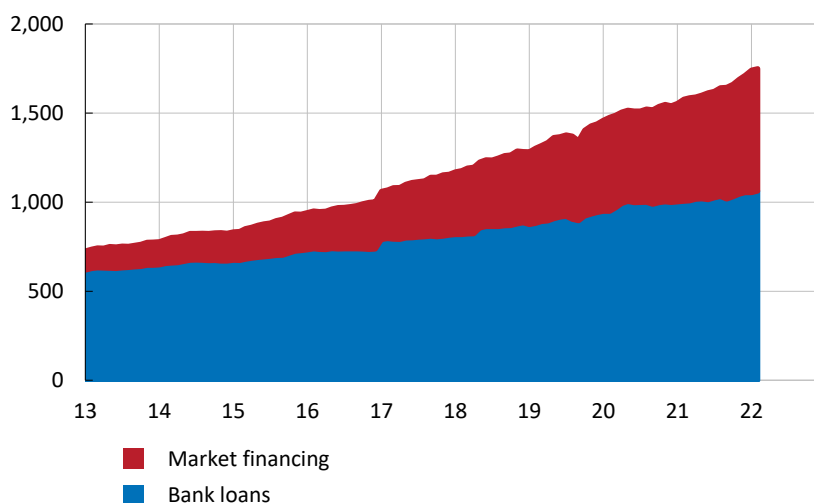
1 Real estate firms are important to financial stability

In the low-rate environment that has coined the economy in recent years, real estate has become an increasingly attractive investment. Adding to that, the robust state of the economy has led to increased demand for business premises, which has given solid growth in rents. Improved cash flows have contributed to a rapid increase in real estate values. Interest in acquiring properties has, at the same time, increased and investments have been financed by rising borrowings at real estate firms.

The debts of real estate firms have grown faster than both Sweden's GDP and the firms' own earnings in the form of net operating income.² Between 2009 and 2021, net debt in relation to net operating income grew from a ratio of around 10 to 15.³ The real estate firms have essentially increased their loans through financing on the capital market (Figure 1).⁴ However, also banks – which already had substantial exposures to the real estate sector – have increased their lending to real estate firms.

Figure 1. Indebtedness of real estate firms, 2013–2022

SEK billion



Note. Includes the borrowings of the real estate sector. Refers to nominal positions, all currencies. Market financing includes corporate bonds and commercial paper.

Source: Statistics Sweden and the Riksbank.

² Net operating income refers to the real estate firms' rental income minus their direct administrative expenses.

³ See Sveriges Riksbank (2021a).

⁴ Investors have, to a growing extent, sought corporate bonds to increase yield on their fixed-income investments, which has led to lower borrowing costs for many firms. At the same time, banks have been subjected to tightened capital requirements. These rules are fundamentally good for financial stability because more capital improves the banks' resilience to shocks. For the banks, it has the same time meant an increased cost of capital. To maintain return level on loans, banks have chosen not to cut the lending rate to the same extent as interest rates in general have declined.

Real estate firms now account for just over 40 per cent of the total volume of bank loans and bond loans to non-financial corporations. Large and fast-growing debts generally make borrowers more sensitive to shocks, which could in turn affect their ability to repay their loans. The substantial loans of the real estate firms make them sensitive to higher interest rates mainly, but also for lower rental income potentially caused by a generally weak progression of the economy.⁵

The extensive loans also make the commercial real estate sector an important factor for the financial sector as a whole. This means that problems in the commercial real estate sector could cause substantial credit losses for financial entities. This applies in particular to the Swedish banks, which account for around 60 per cent of real estate firms' loans. In the past, the considerable loans of real estate firms have meant that problems in the sector have repeatedly created or aggravated financial crises. In light of this, it is important to analyse different risks that could adversely affect the commercial real estate sector, and ultimately financial stability.

Can changed preferences affect demand for office premises?

During the pandemic, many households and businesses have changed their behaviours and preferences, for instance by working much more from home. It is difficult to determine at this stage whether there will be a structural change in office use and what long-term consequences this change might have.⁶ However, it makes sense to attempt to understand what such a change in demand for office space would imply for real estate firms and financial stability. In light of this – and the fact that office properties make up a substantial share of the real estate sector – in this economic commentary we focus on the effects that reduced demand for office properties could have on financial stability.⁷

Real estate firms also face other challenges in addition to the possible effects of a structural change in office properties. These include globally rising interest rates and signals from several central banks concerning less expansionary monetary policy. These factors could lead to heightened uncertainty and higher risk premiums, or a lower risk appetite among investors and lenders. This could in itself have a negative impact on the commercial real estate sector – although studying such effects is not the aim of this economic commentary.

⁵ Interest rates also affect real estate values. The yield requirement of real estate firms has gradually declined and is currently at historically low levels. The drop in required yield is a primary reason for the rapid growth in value of commercial properties in the past few years. For more information, see Finansinspektionen (2019). The consequences of rising interest rates on earnings and real estate values also depend on the extent to which rising interest rates are linked to higher inflation. This is because rent contracts are often inflation-indexed.

⁶ Other real estate segments such as commercial and logistics properties have, for many years, been undergoing structural changes, chiefly due to the increase in e-commerce.

⁷ Out of the properties that are managed by professional entities, office properties account for the largest share, in terms of market value, according to MSCI (MSCI inc. [MSCI data notice](#)). Properties containing rented residential units and commercial properties also represent relatively large shares, while hotel properties and industrial and logistics properties are relatively small.

1.1 Offices are found in different locations and forms

Sweden's real estate stock is largely owned by real estate firms which are diversified in that they own properties in different parts of the country and within different segments, such as rented residential units, commercial properties and offices. Office properties are found all over Sweden, although most of the real estate value is in Stockholm, Gothenburg and Malmö. In these cities, office properties are located in different areas that can be divided into three categories. *Central Business District (CBD)* is the most central area of the city where office properties with the highest rents and values are located. There is also the category *within city boundaries ex. CBD* in all cities which consists of the remainder of the city's central areas. Finally, in each city there are office areas *outside of city boundaries*.⁸

In general, the tenants' office space varies with the distance of the office from the city centre, meaning that offices are generally smaller in CBD than in other areas. This can be explained by many smaller businesses, particularly in the service sector, having centrally located offices, while larger businesses have offices that are not as central.

The size of the offices and the number of employees working there also indicate the length of the leases entered between the tenant and the property owner. Smaller offices are generally let through shorter leases than larger offices. This is because larger offices need greater adaptations ahead of the tenant moving in. The property owner therefore wants to sign a relatively long lease to be able to recoup the investment made to adapt the premises. The length of the lease generally extends over one to ten years, although most leases for office premises have a three- to five-year term.

Growing firms in need of larger premises can often upgrade during the term of the lease if they remain with the same property owner. However, when firms have less of a need for office space, they often need to keep to the lease they have signed with the property owner. The length of the lease therefore affects how quickly the firm can reduce its rented office space. If the firm chooses to move and switch property owners before the end of the lease, they often need to find a new tenant for their former office. The office can then be sublet to the new tenant until the lease has expired, even though the original tenant's payment liability in relation to the property owner remains in place throughout the term of the lease.

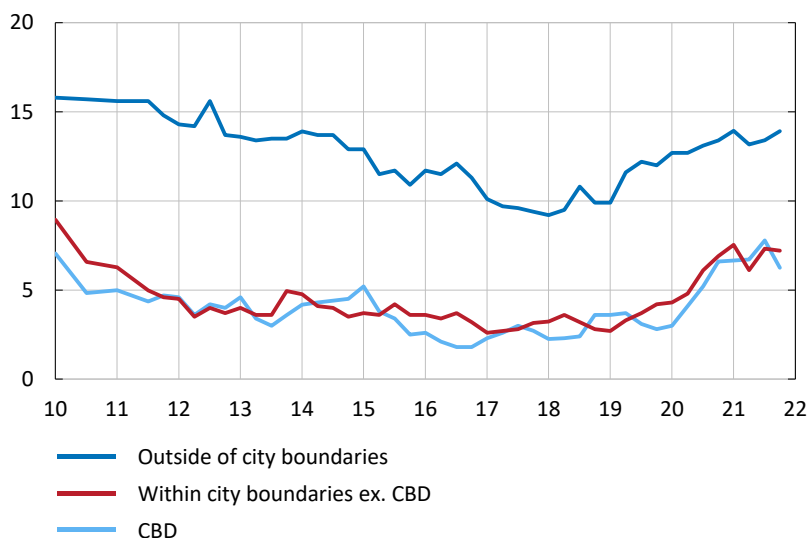
The length of the lease thus determines the conditions for how easily and how often a tenant can change office. Therefore, the vacancy rate for real estate firms can be affected more quickly if the length of the lease is shorter. This might be why the vacancy rate for properties in Stockholm CBD increased by 4 percentage points between March 2020 and March 2021, while the increase outside of city boundaries was just over 1 percentage point (Figure 2).⁹

⁸ In Stockholm this includes suburban areas such as Solna, Globen and Kista.

⁹ This refers to the vacancy rate in terms of surface area. It equates to the proportion of the premises that lacks a tenant or that is empty for another reason. The financial vacancy rate – which is the assessed market rent for unrented spaces in relation to total rental value – is much more important to the property's value, as different spaces in the same property can have varying rent levels. During the same period, the financial vacancy rate rose slightly more than the surface area vacancy rate.

Figure 2. Share of vacant office premises in different parts of Stockholm, 2010–2022

Per cent



Note. Central Business District (CBD) refers to the most centrally located office properties in Stockholm’s inner city. Share of vacant office premises (vacancies) refers to the proportion of vacant office space in relation to total office space. Includes office premises that are vacant or will become vacant up until 30 June 2022.

Source: Citymark

1.2 New behaviours can reduce the need for office space

After the pandemic broke out in March 2020, numerous restrictions were introduced to reduce transmission of the virus, which meant that households and businesses had to adapt. For example, many people who were able to work remotely did so to a much greater extent, although even before the pandemic around 40 per cent of the labour force in Sweden worked from home to some extent.¹⁰ The share in Sweden was higher than the EU average of 16 per cent. This may be due to a relatively high proportion of the Swedish labour force working in offices. The office-bound labour force in Sweden was considered to have worked one day a week from home on average in 2019.¹¹

The extent to which the shifts in behaviours and preferences that took place during the pandemic will persist is uncertain. Several studies among employees indicate that teleworking might increase.¹² However, it is not certain that employers will permit it,

¹⁰ Approximately 6 per cent and 30 per cent, respectively, worked from home “often” or “sometimes” (European Parliament 2021).

¹¹ Real estate advisors Catella made that assessment in an analysis published in 2021.

¹² In a survey by Akavia (2021), 70 per cent responded that they wished to work from home two to four days a week, and in a survey by Sifo/Elfa (2021) 40 per cent responded that they intended to work from home as much in 2022 as in 2021. A survey by Novus/TCO (2021) shows that more than 90 per cent of office workers wish to continue working remotely at least one day a week after the pandemic.

or adapt office space, accordingly. In addition, teleworking occurred relatively extensively in Sweden even before the pandemic. This might mean that any structural transformation that leads to lower demand for offices will have less of an impact in Sweden than in other EU countries.¹³

Numerous factors affect demand for office space

A permanent increase in teleworking could bring about changes in businesses' use of, and hence demand for, office space. For example, the fact that fewer people are in the office can lead to a lower demand for office space. But more teleworking might also lead to a need for larger spaces for different types of meeting, for instance hybrid meetings, which could move things in the opposite direction. Employment growth in office-intensive sectors may also lead to greater demand for office space.¹⁴

The consequences of reduced demand for office space may also depend on office space supply. In the past few years, an increasing amount of new office premises have been built in Sweden, although the addition is small in relation to the stock. The more supply increases ahead, the greater the vacancies that could emerge if demand sags.

Higher vacancies could bring down real estate values

It is difficult to judge what the overall net effect will be of all factors that affect demand for and supply of office space. For this analysis, we assume that the net effect is negative and that higher vacancies emerge in office properties. This enables us to assess how higher vacancies, as an isolated event, could ultimately affect financial stability. At the same time, it should be noted that variations probably emerge between different segments of the office market. For example, vacancies might increase more for less attractive offices in outdated office properties outside of the city, than for offices in modern and centrally located office properties.

Higher vacancies primarily affect the revenues of the real estate firms because they lose out on rental income when they have vacant spaces.¹⁵ This could ultimately lead to lower rent levels for comparable offices as an excess supply of space emerges.¹⁶ If current rent levels or expectations concerning future rent levels and occupancy rates decline, this will affect real estate values negatively.¹⁷ However, lower rental income

¹³ Assumes that the relatively high proportion of people who worked remotely in Sweden is not only explained by Sweden having a high proportion of office-bound labour, but also by current valuations of office properties in Sweden reflecting that a relatively high number of people already worked remotely.

¹⁴ During the period 2017–2021 employment in office-bound sectors grew by 4 per cent annually on average. This growth was higher than the increase in the supply of new offices.

¹⁵ If tenants reduce the space of their premises in connection with renegotiation, the rental income level for the real estate firms could however fully or partly be maintained if rent levels have increased since the previous lease was signed.

¹⁶ In the past, rent levels in new leases have declined in line with rising vacancies. Using data from MSCI and Citymark, the correlation between rent levels and vacancies is estimated to be -0.6.

¹⁷ Properties can be valued using a cash flow model that often has a 10-year forward-looking perspective, meaning that the value is largely based on expectations about future cash flow. Adjusting expected cash flow downwards therefore has greater implications for the value than the initial downturn in revenues caused by higher vacancies. The faster the real estate firms expect that rent levels and vacancies will recover, the less of an impact the initial downturn in revenues will have on the real estate value. A description of a cash flow model is provided in the Appendix "Technical description of cash flow model".

affects real estate values to a lesser extent than would a generally higher interest rate level.

Lower real estate values give a higher loan-to-value ratio. Higher vacancies and lower rental income can thus increase the financial risk among real estate firms and result in greater difficulty for them to honour their obligations in relation to lenders. This can ultimately lead to increased credit losses for the lenders. If the heightened risks transpire, this may lead to negative effects for financial stability. We will come back to this later.

1.3 Credit losses in lending to real estate firms

The banks' lending to real estate firms is often done against collateral in the form of mortgage deeds in the financed properties, with a view to reducing the bank's credit risk.¹⁸ Loans are granted under the assumption that not all customers will manage to repay the loan, known as expected credit losses.

The expected losses for an issued loan can be calculated as:

Expected credit loss =

*Outstanding loan amount * Probability of default * Loss given default*

When a property is pledged as collateral for a loan, the potential loss for the bank decreases in the event of the borrower's failure or default. This is because the bank retains the collateral which can then be sold to cover losses. If the property value decreases, the bank's expected loss on the loan increases, known as credit loss provisions.¹⁹ However, this has a negative impact on the bank's operating result, even if the borrower can continue to make interest and amortisation payments on their loan.

In a scenario with rising vacancies, causing lower rental income and falling property values, the real estate firms' interest coverage ratio would fall while at the same time their loan-to-value ratio would rise. It would then be probable for banks to consider that credit risk in the form of probability of default at individual firms and the real es-

¹⁸ As most property purchases and sales take place in company form (because of tax technicalities), the acquirer of a property buys the shares in the company that owns the property. For this reason, sometimes the shares in the company that owns the property are sometimes used as collateral instead of the property itself. Other types of pledging also occur, such as titled collateral in the parent company, or collateral in intra-group debt instruments. A loan associated with collateral entails a relatively lower cost of capital for the bank.

¹⁹ When calculating *Loss Given Default* (LGD), the banks do not apply the market value of the property, but an adjusted value using a 'haircut'. This is done so that the LGD values will be representative even in situations of deteriorated market values. The size of the haircut tends to differ between collateral and banks. This means that the bank does not necessarily need to increase its credit loss provisions in the event of slight reductions in the value of the collateral.

tate sector as a whole would rise. Hence, the bank would experience a need to increase the volume of credit loss provisions.²⁰ If the credit losses are too high, and cannot be covered by the bank's operating result, the bank's equity would decrease.

A shock in the form of rising vacancies could thus lead to an increase in credit risk in banks' lending to real estate firms. As banks' lending to real estate firms is largely concentrated to office properties and the area around Stockholm, such a shock there could result in relatively large credit loss provisions.²¹

Losses can also arise from other financiers, such as investors in corporate bonds. They can experience value changes in their bond holdings faster than the banks, as the market value is often updated daily. If the value decreases, for example because market participants find that credit risk has increased, this leads to negative unrealised value changes in the investors' bond portfolios.²² If the bonds are sold on the secondary market when the selling price is below the purchase price, the loss is realised.²³ If the issuer ultimately defaults and cannot repay the borrowed amount, credit losses also arise that can be greater for bond investors than for banks, because bonds are, as a rule, not issued against collateral.

Lower real estate values limit the borrowing capacity of real estate firms

When real estate firms take out bank loans, and in certain bond issuances, the credit contracts often contain financial covenants.²⁴ These are undertakings on the part of the borrower that enable the lender to reduce their exposures before the borrower's creditworthiness is undermined too much. Hence, the covenants provide additional peace of mind for the lender on top of any collateral. If the borrower breaches one or more of these covenants, the lender can for instance require a higher interest rate or terminate the credit and call for its immediate repayment.

If property values or the earnings of real estate firms decline to such an extent that they approach or exceed the covenants, this can make it difficult for real estate firms to refinance existing loans. It might also mean that they need to refinance the loans at a much higher cost.²⁵ This could put even more strain on real estate firms with higher financing costs and a need to sell off properties to reduce their loans – which may

²⁰ According to the IFRS 9 accounting standard, recognition of credit losses is based on expectations and the size of the provisions is based on classification of credits into three stages. Between the stages, there is a change in the size of the provision and the horizon used for calculating the expected credit loss. For example, in order for a loan to be reclassified from stage 1 to stage 2, a material increase in credit risk must have occurred since initial recognition. It is usually termed as a predetermined percentage change in the level of *probability of default* (PD). Loans are reclassified to stage 3 if they are considered impaired.

²¹ See Finansinspektionen (2019).

²² Increased credit risk can lead to the credit spread widening and the price of the bond falling.

²³ The investor may however have received coupon payments that partially compensate for this loss.

²⁴ For example a minimum interest coverage ratio, maximum permitted loan-to-value ratio and maximum proportion of pledged assets.

²⁵ If asset values decline, so too does the firms' borrowing capacity (irrespective of any covenants) as they can be seen as a function of the borrower's long-term creditworthiness. It can be described using the "balance sheet" transmission channel. See e.g. Bernanke and Gertler (1989), Kiyotaki and Moore (1997), Bernanke and Gertler (1995), Ehrmann and Fratzscher (2004), Basel Committee on Banking Supervision (2011) for more information on that channel and the mechanisms that affect the firms through it.

lead to further downward pressure on real estate values. In such a vulnerable financial situation, it is not improbable that real estate firms would also have difficulty in raising refinancing through the corporate bond market. This could prompt a revaluation of the market's view of the risks in real estate firms in more general terms, which could lead to existing bond loans instead having to be refinanced with the banks. On the whole, this could present a further challenge for the banks, which would then need to increase their exposure to real estate, which would increase their need for liquidity and new capital. In this economic commentary, we do not consider the banks' ability to deal with such a situation.

2 Models for estimating impacts of higher vacancies

There are many ways of assessing the effects that long-term reduced demand for office properties may have on real estate values. We use two models, the first of which is a pricing model devised by the International Monetary Fund (IMF) to estimate how higher vacancies can affect real estate values.

The IMF model breaks down the real estate value for a given period of time in terms of net operating income, risk premium, interest rate and inflation, in accordance with Campbell and Shiller (1989). Then, the dynamics between these variables, jointly with additional variables such as the GDP gap, are described using a structural vector autoregressive (SVAR) model.²⁶ The objective is to capture the linear interaction between the input variables, both presently and over time. One advantage of the model is that we can apply a shock in the form of higher vacancies that are phased in over time. Another advantage is that the model also takes into account, to a certain extent, how vacancies affect other factors that have historically had an impact on property values, such as risk premiums. This means however that the model cannot capture relationships that have not been observed in the past, even though they could arise in the future. Another disadvantage is that the relationships between the input factors are not always clear, but can have changed over time, which means that the model estimates these relationships with great uncertainty. The fact that we have few observations in relation to the number of input variables and that there is sensitivity to which data are used in the model has also added to the uncertainty of the estimations.

To reduce uncertainty in the conclusions, the IMF's model is supplemented with a cash flow model.²⁷ Real estate firms and real estate valuers in real estate valuation often apply a cash flow model. Like in the IMF's model, property-specific variables are included such as net operating income and inflation in the cash flow model. But in contrast to the IMF's model, which is backward-looking and based on historical relationships between the input variables, the cash flow model is forward-looking and based on assumptions about future revenue. In the cash flow model, however, the

²⁶ The model was used by the IMF in its financial stability report in the spring of 2021, see IMF (2021). See the Appendix for more information about the model and input variables.

²⁷ We do not have access to the results obtained by the IMF when it applied the model to different countries individually. However, the IMF's aggregated result, which includes numerous countries, shows that there are wide credible intervals.

higher vacancies are not permanent, but are assumed to increase linearly in the first five years, to then decline to the same extent in the following five years.

The cash flow model that we use is simplified and chiefly aims to supplement and add nuance to the results that emerge from the IMF's model. Because the cash flow model proceeds on the basis of expected cash flow, the results will only reflect such changes in real estate values that are due to altered expectations concerning the future vacancy rate and rent growth. The IMF model does not take account of these expectations. As expectations for the entire model period are revised today, the application of the cash flow model can be regarded as a static exercise.²⁸ In reality, a shift in expectations would probably have been gradually phased into the real estate firms' valuations over several years, which could mitigate the consequences of altered expectations. Because the extent to which higher vacancies affect future rent levels is uncertain, we use three different rent growth outcomes per vacancy scenario.²⁹

Three scenarios in which lower demand is phased in gradually

In order to assess the effect of increased teleworking on the office market, we have used a survey performed by real estate advisors Catella. They have studied existing leases covering just over 60 per cent of the Stockholm office market with a view to evaluating the three different scenarios, which all lead to lower demand for office space.³⁰

The direct link between the scenarios and vacancies concerns surface area vacancy, not financial vacancy. To simplify the rationale, we assume that surface area vacancy equals financial vacancy. Because of this, however, our calculations might overestimate the effect of rising vacancies on real estate values. One example is if it turns out that increased vacancy affects primarily offices in less attractive locations. The financial vacancy rate will then be considerably lower than the surface area vacancy rate, since the rental value is lower in less attractive locations.

In scenario 1 the marginal effect of employees working remotely one more day a week is evaluated. The impact of increased teleworking is not considered to affect demand for office space to the same extent; rather, the scenario leads to vacancies in the entire office stock in Stockholm increasing by 4 percentage points overall. **In scenario 2**, the marginal effect of another two to three days teleworking is evaluated. This increase is estimated to lead to a rise in vacancies by 11 percentage points.

Another scenario is being evaluated because some tenants may have the potential to reduce their office space through more efficient use. In 2020 the average office space

²⁸ We only adjust vacancy level, expected rent growth and administrative expenses. Everything else that could perceptibly affect valuation is held constant in this exercise.

²⁹ The calculations are performed by comparing a cash flow analysis with the base scenario in which vacancies are expected to decrease and rent levels are expected to increase, with an alternative cash flow analysis according to Catella's vacancy scenarios. For each vacancy scenario, we perform three separate calculations in which 1) rent growth is expected to be unchanged compared with the base scenario, 2) rent growth is expected to decline somewhat in the initial years to then rise somewhat, And: 3) rent growth is expected to decline sharply in the initial years to then rise sharply. A more detailed description of the method is presented in the Appendix.

³⁰ See Catella (2021).

per employee was almost 22 square metres in a review of office leases in nine different sectors in Stockholm. It is assumed that those that are clearly above the average could reduce their office space and hence, all else equal, reduce their rental costs. In **scenario 3**, all tenants, who are deemed to have the opportunity, rationalise their use of office space. They then reduce the rented area to between 14 and 18 square metres per employee, depending on the sector in which the tenant operates. The efficiencies in themselves correspond to an increase in vacancies of around 35 percentage points. It is important to note that, even if employers have the possibility to reduce office space, this need not mean they want or need to do so. The reason can be that there should be a lot of space in the premises for social spaces, meeting rooms or large individual offices.

Using the IMF's model and cash flow model, we test what happens to real estate values in the three scenarios described above, in which vacancies in the office stock increase by 4, 11 and 35 percentage points, respectively.

The speed at which vacancies could increase is uncertain. In addition, the increase, if it occurs, will take place as leases are renegotiated. As mentioned previously, length of leases varies depending on location and size of office premises. As most leases are between three and five years, we have calibrated a phase-in which, in the models, generates a vacancy rate according to the three scenarios after five years.

3 Higher vacancies could bring down real estate values

Rising and permanently higher vacancy rates, according to the IMF's model, lead to reduced values of office properties in all three scenarios. However, the results carry great uncertainty and should be seen as indications of how much real estate values can change.³¹ Another factor to consider is that the IMF's model does not take account of operational changes that real estate firms can implement to mitigate the effects of higher vacancies. For example, converting office premises into other areas of use such as residential units.

In the two vacancy scenarios that are based on vacancies increasing as a result of increased teleworking, real estate values decline by a total of 5 and 11 per cent, respectively, after five years (vacancy scenario 1 and 2 in Figure 3).

The value change in vacancy scenario 1 is relatively limited compared with in the financial crisis of 2008–2009 when values of office properties in Stockholm fell by almost 9 per cent.³² The outcome from vacancy scenario 2 resembles all the more the

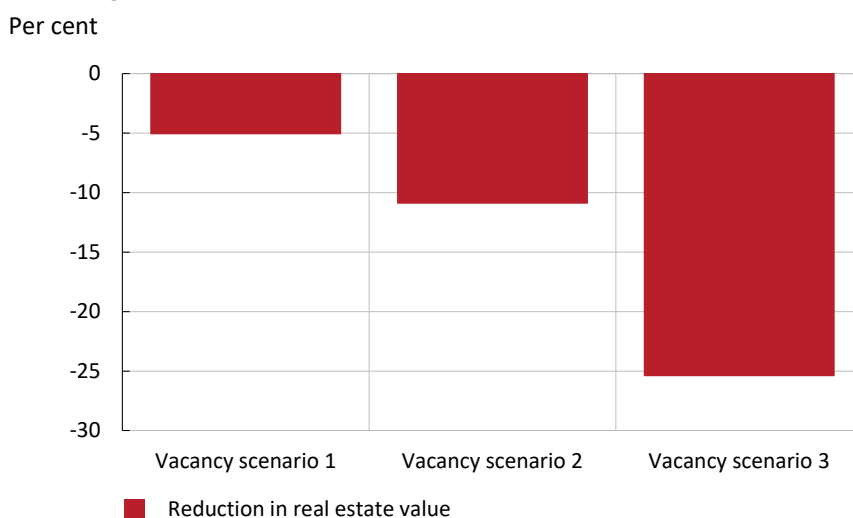
³¹ The estimations of the method result in very wide credible intervals (a type of uncertainty band within Bayesian methodology) that extend between positive and negative values. The wide intervals are partly a result of there being few data points in relation to the number of parameters in the model. It is thus uncertain whether an increase in the vacancy rate would lead to a drop in real estate values. The calculation results presented here are the median estimation in each scenario. Graphs with related credibility intervals are presented in the Appendix.

³² According to data from MSCI.

outcome in the financial crisis in terms of value changes. However, in the financial crisis, real estate values did not drop chiefly because of higher vacancies.³³ It was instead a result of higher yield requirements, which rose by 1 percentage point on the back of rising risk premiums. Yield requirements, which are constant in our calculations, generally have a greater impact on real estate values than vacancies.

In vacancy scenario 3, in which firms improve efficiency in their use of space and hence reduce their demand, real estate values fall much more. After five years, it is considered that real estate values will have fallen by 25 per cent (Figure 3). In this much more adverse scenario, it is also probable that risk premiums on real estate would rise, as it can be assumed that uncertainty about future values and developments would be greater. This could spell higher yield requirements, which would put more pressure on real estate values than shown in the results from the model.

Figure 3. Effects of higher vacancies on office property values in Stockholm, according to IMF's model



Note. Refers to the three scenarios with rising vacancies, which are phased in gradual over 20 quarters (5 years) and the estimated median effect of the vacancies on real estate values. The figure shows the 5-year outcome.

Source: The Riksbank.

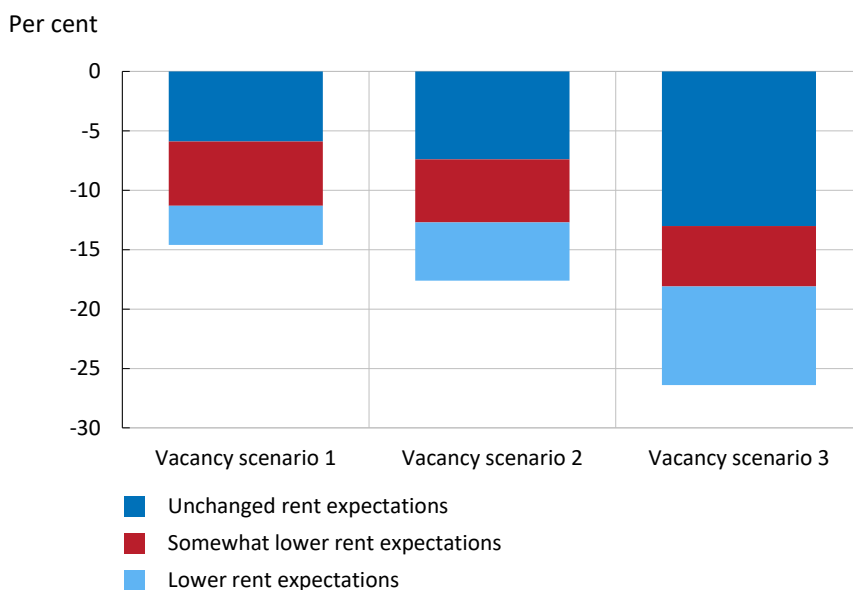
Like the IMF's model, the higher vacancies result in lower real estate values in the cash flow model too. Depending on the extent to which higher vacancies affect rent level expectations, the consequences for real estate values will vary. Rising vacancies and unchanged rent level expectations are estimated to affect real estate values negatively by between 6 and 13 per cent depending on vacancy outcome (Figure 4). This is in line with the two first outcomes in the IMF's model but much milder than in the third outcome in the IMF's model. The effect on real estate values in the cash flow model in unchanged rent level expectations is not more adverse because of a number

³³ Office vacancies in Stockholm rose only slightly in the financial crisis, by just over 2 percentage points. Furthermore, the average rent level that real estate firms could charge increased at the beginning of 2008 to then decline slightly in 2009. Overall, the average rent level for office premises that real estate firms could charge increased by just over 1 per cent between 2007 and 2009.

of assumptions in the model. For instance, yield requirements are unchanged, vacancies decline after the first five years and rental income is higher at the end of the model's horizon.

Expectations of rent levels affect the property value to a large extent. We therefore complement the vacancy scenarios with falling rent expectations. When vacancies rise, this tends to have a negative impact on the possibility of future rent increases. If future rent growth also is expected to decline, it is calculated that real estate values could decrease by between 11 and 26 per cent, depending on the severity of the scenario. The marginal effect on real estate values ensuing from the most adverse downward adjustment of rent expectations, on top of increased vacancies, is represented by "lower rent expectations" (light blue field in Figure 4). Again, it should be noted that the yield requirements are kept unchanged in our calculations. Risk premiums would probably have risen in all of our scenarios as a result of heightened uncertainty about the future earnings capacity of the sector, which would have had even more of a negative impact on real estate values.

Figure 4. Effects from higher vacancies on office properties in Stockholm, according to cash flow model



Note. Refers to results from a simplified cash flow model with three scenarios of rising vacancies that are phased in linearly over five years, to which we also apply three separate outcomes for rent expectations.

Source: The Riksbank.

Diversification reduces the impact of lower values on office properties

Real estate firms often own other types of real estate besides office properties. A structural transformation that affects demand for office space need not have a negative impact on other real estate segments. The financial strength of firms that have a more diversified real estate holding will not be affected as much as the calculated effect on the office segment.

Lower values in one or several real estate holdings could increase the loan-to-value ratio for real estate firms. We have taken a closer look at a small sample of real estate firms which, to varying degrees, own office properties, and how their loan-to-value ratio would be affected if the values of office properties declined.³⁴ The value-weighted loan-to-value ratio among these real estate firms is around 48 per cent.³⁵ The vacancy scenarios above and subsequent value reductions would lead to this loan-to-value ratio potentially increasing by 1 to 7 percentage points, depending on the vacancy scenario applied. This means that the firms' value-weighted loan-to-value ratio could rise from around 48 to 55 per cent in the most adverse vacancy scenario.

There is a variation in the proportion of office properties held by the respective real estate firms. Therefore, some firms in the sample could potentially have a loan-to-value ratio that increases to around 65 per cent. Such a high loan-to-value ratio often constitutes a threshold level in the financial conditions (financial covenants) linked to the real estate firms' credit contracts. If the real estate firms were to breach one, or several, of these financial conditions, this could pose further difficulties for them to refinance existing loans on reasonable terms. Such a course of events could generate a number of adverse knock-on effects for property values and the financial situation of real estate firms. If such a course of events proved widespread, this could ultimately cause major credit losses to banks and other financiers.

4 Risks to financial stability could emerge

The results from the IMF's model and cash flow model, both of which carry great uncertainty, show that real estate values could fall on the back of increased vacancies in office properties. The decrease in value for office properties is generally limited in the vacancy scenarios where more people work from home and expectations of future rent levels are not significantly affected. Hence, the consequences for banks in terms of increased credit loss provisions ought also to be small.

If however vacancies are followed by lower expectations about future rent levels, results show that implications for both real estate firms and lenders could be greater. At worst, it could lead to greater credit loss provisions. Nonetheless, it is considered that the real estate firms would maintain sufficiently high rental income and hence earnings to enable them to continue to honour their obligations to lenders. We therefore consider that the risks of financial stability are small as a result of the vacancy scenarios in which more people work from home. Although the stability risks are small, the situation would pose a major challenge for many real estate firms.

The increase in vacancies and the decrease in property values are more significant in the scenario where businesses are reducing office space through more efficient use of the premises. This result is shown in both models. If this scenario were to transpire, the banks might need to make large credit loss provisions. Above all, however, some

³⁴ The sample includes Atrium Ljungberg, Balder, Castellum, Corem, Fabega, Hufvudstaden, Wihlborgs, Vasakronan, FastPartner, Nyfosa, Platzer, Wallenstam.

³⁵ "Loan-to-value ratio" is defined here as the real estate firms' assets under management divided by their interest-bearing liabilities, which might differ from the real estate firms' own definition of loan-to-value ratio.

real estate firms might find it more difficult to refinance or increase existing loans as their borrowing capacity is limited, for instance because they are in breach of the financial conditions laid down in the loan agreements. Such a situation could pose financing challenges, and have further negative consequences, for these firms, as revenue is at the same time lower. Overall, this scenario could thus lead to substantial risks to financial stability.

The analysis in this economic commentary has focused on risks to financial stability resulting from a general decline in demand for offices. As the office market is heterogeneous, there are real estate firms with outdated properties in less attractive locations that could suffer much higher vacancies in the event of sagging demand for office space. The effects of this could however be mitigated by robust development in other real estate segments or geographic areas, and through operational measures at the real estate firms concerned. For real estate firms that have a large proportion of outdated properties in less attractive locations, this could however cause considerable problems in terms of lower earnings and poorer ability to honour their obligations towards lenders. This could in turn force these real estate firms to sell off properties which, at worst, could cause a negative spiral in which real estate values also decline in other segments and geographic areas.

Besides vacancies within the office segment, there are a number of other factors that could affect the real estate firms in future, and which are beyond the scope of the analysis of this economic commentary. For instance, a high interest rate level could, in itself, cause a rise in the yield requirements of real estate firms, which could bring down real estate values. This could force banks to make substantial credit loss provisions linked to their lending to real estate firms.³⁶ In addition, events in the rest of the world that affect macroeconomic developments may mean that positive assumptions underpinning current property values are no longer realistic. Finally, there are vulnerabilities in the corporate bond market in the form of lack of transparency and insufficient liquidity. These vulnerabilities, if aggravated, can affect the ability of real estate firms to issue bonds.³⁷

³⁶ Finansinspektionen has performed stress tests in which real estate firms' revenues decline while at the same time interest rates rise. The stress tests indicate that the banks' credit loss provisions could be equal in size to, or greater than, the capital held by the banks for real estate exposures. See Finansinspektionen (2021).

³⁷ See Sveriges Riksbank (2021b).

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APPENDIX

Technical description of the IMF's model

The IMF's model estimates the extent to which commercial real estate prices can be explained by other economic factors. It is based on Campbell and Shiller (1989) in which real estate prices can be described using present and expected growth in the properties' net operating income (NOI), and present an expected yield on assets under management:

$$\log\left(\frac{Price_t}{NOI_t}\right) = k + \rho \log\left(\frac{Price_{t+1}}{NOI_{t+1}}\right) + \Delta \log(NOI_{t+1}) - Return_{t+1}, \quad (1)$$

where $Return_t = Risk\ premium_t + STIBOR\ 3M_t - Inflation_t$.

The variables in equation (1) are assumed to be determined in a general-equilibrium model and can be expressed in a structural vector autoregressive (SVAR) model:

$$Ay_t = B_0 + B(L)y_{t-1} + u_t, \quad (2)$$

where $y_t = (NOI\ growth_t, Risk\ premium_t, STIBOR\ 3M_t, GDP\ gap_t, Inflation_t, Credit\ gap_t, \frac{Money\ supply\ M3_t}{GDP_t}, \frac{Direct\ investments_t}{GDP_t}, Vacancy\ rate_t)'$.

A is a matrix that is to capture the relationship between the variables in period t, $B(L)$ is to capture the lagging effect from previous shocks and u_t is a vector of structural shocks.

The parameters are then estimated using Bayesian methodology. A thorough description of the IMF's model and estimation procedure can be found in IMF (2021).

The data used in the IMF's model cover the period from the first quarter of 1998 to the last quarter of 2021. The period has been chosen because it is the longest continuous period for variables in the IMF's model that concerns the commercial real estate market in Sweden.

Data used in the IMF's model

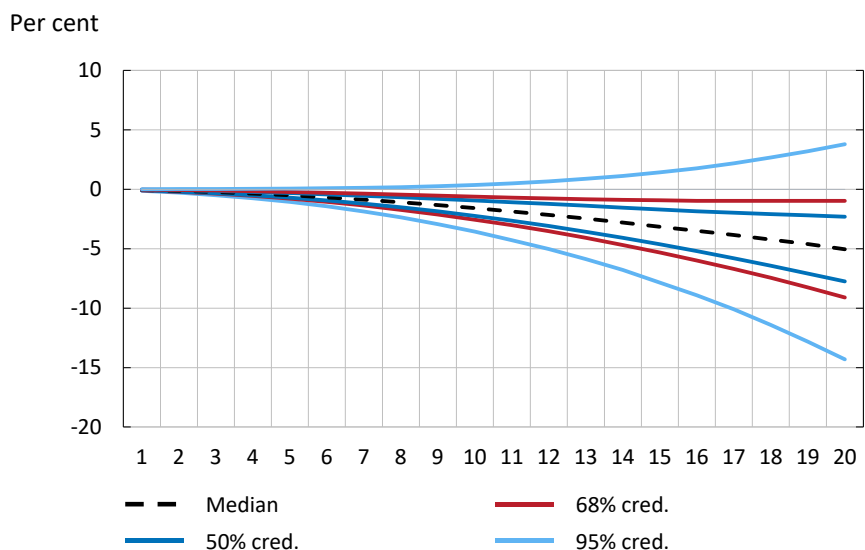
Data	IMF's designation	Source
Net-operating-income-growth	Net-operating-income growth	MSCI
Risk premium	Risk premium	MSCI and Macrobond
Stibor 3M	3M rate	Macrobond
GDP gap	Output gap	The Riksbank and Statistics Sweden (SS)
Credit gap	Credit gap	The Riksbank and SS
Money supply 3M ³⁸	Broad money	Statistics Sweden
Direct investments	Capital flow	Statistics Sweden
Real estate price	Commercial real estate price	MSCI
Consumer price index ³⁹	Consumer price index	Statistics Sweden
Vacancy rate	Vacancy rate	MSCI

³⁸ This series is filtered with an HP filter. In IMF's report, the equivalent series is adjusted by its average.

³⁹ Inflation is calculated based on the change in the Consumer Price Index.

Credible intervals according to the IMF's model

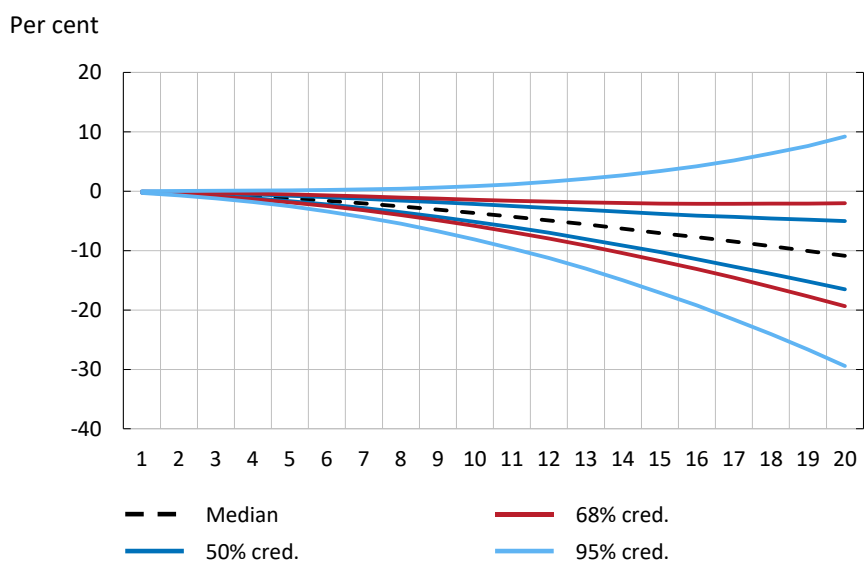
Figure A.1. Effects on real estate values in the IMF's model according to vacancy scenario 1



Note. Price change (per cent) in real estate values over 20 quarters.

Source: The Riksbank.

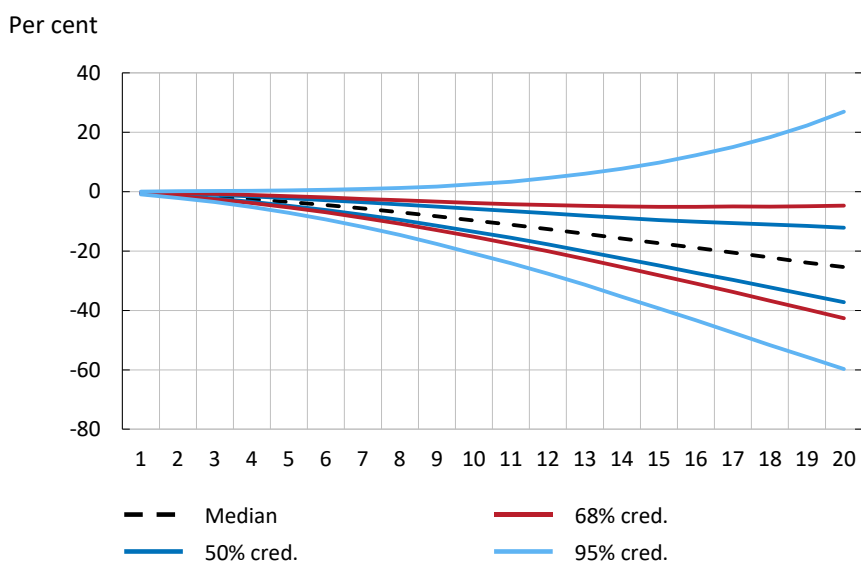
Figure A.2. Effects on real estate values in the IMF's model according to vacancy scenario 2



Note. Price change (per cent) in real estate values over 20 quarters.

Source: The Riksbank.

Figure A.3. Effects on real estate values in the IMF's model according to vacancy scenario 3



Note. Price change (per cent) in real estate values over 20 quarters.

Source: The Riksbank.

Technical description of cash flow model

To gain an understanding of how values of office properties can be affected by altered expectations concerning vacancies and rent levels, we use a simplified ten-year cash flow model.⁴⁰ This model enables us to estimate how real estate values are affected if expected earnings capacity changes according to different scenarios and if this change is reflected in valuation already today. To do this, we compare two hypothetical valuations with each other. In one valuation, we use an initial position in which rental income is expected to rise and vacancies to fall. In the comparative valuation, we use an estimate of rental income and a negative change in vacancies according to the three vacancy scenarios.⁴¹ This simplified cash flow model totals the value of the real estate based on the following parameters⁴²:

$$\sum_{t=0}^n \frac{\text{Net operating income}_{t+n}}{(1 + \text{yield})^{t+n}} + \frac{\frac{\text{Net operating income}_{t+10}}{\text{yield}}}{(1 + \text{yield})^{t+10}}$$

The calculation of the real estate portfolio's value in the initial position is performed by assuming an inflation rate of 2 per cent annually which affects both the total rental

⁴⁰ For more information on cash flow models, see e.g. Geltner and de Neufville (2018) and Koller et. al. (1990).

⁴¹ As prepared by Catella.

⁴² Net operating income refers to the real estate firms' rental income minus direct administrative expenses.

value of the portfolio and administrative expenses. On top of inflation, we assume that the rental value increases by a further 1 per cent annually.⁴³ The occupancy rate is assumed to be 93 per cent in year 1 and gradually increases to 97 per cent. We assume that the discount rate (yield requirement) for the real estate portfolio's cash flow (years 1–9) is 4.7 per cent. To keep the calculations simple and Always the residual value (year 10) not to have too much weight of the total portfolio value, the same discount rate is also , used when calculating residual value.⁴⁴ When calculating the initial position, the residual value makes up almost 70 per cent of the total value of the real estate portfolio.

When the different scenarios are applied, vacancies are instead assumed to increase linearly in the first five years, to then decline to the same extent in the following five years (the occupancy rate is thus 93% in period t and 93 percent again in period $t+10$).

Increased vacancies tend to have a negative impact on the possibility of increasing rents (above inflation). The extent to which rent levels might change is uncertain, however, and largely depends on other factors besides the volume of vacant office space. In light of this, we apply three different outcomes for rent growth expectations in each vacancy scenario. The two first outcomes are the same for all three vacancy scenarios, while the third is somewhat more adverse the higher the vacancies for which we test. In all three outcomes, inflation is the same and affects the rental value positively each year, as we assume that inflation will be positive at 2 per cent.

These are the three outcomes we have applied to each vacancy scenario:

- 1) Unchanged expectations – expectations about rent growth are the same as in the initial position (1 per cent/year).
- 2) Slightly lower expectations – rent growth is expected to be 0 per cent in years 1–5 and subsequently 1 per cent annually in years 6–10.
- 3) Substantially lower expectations – *expectations about rent growth vary between the vacancy scenarios, but rent growth is assumed to be negative in four out of ten years.* The progression of expected rent growth is a reflection of how rent levels changed for offices in Stockholm in the years following the IT crisis in 2000 when there was an oversupply of office space. The magnitude has been adjusted – upwards or downwards – depending on the severity in the vacancy scenarios. The overall rent growth (excluding inflation) is 2 per cent after ten years in all three cases linked to the rent expectation outcome. With regard to inflation, rental value increases by around 25 per cent in these three outcomes (a–c) for expected rent growth.
 - a. positive year 1, slightly negative years 2–5, and positive years 6–10,
 - b. positive year 1, negative years 2–5, and positive years 6–10,
 - c. positive year 1, substantially negative years 2–5 and strongly positive years 6–10.

⁴³ The rental value is the value that the property, or the real estate portfolio, is expected to be able to generate when fully occupied. Rental income is thus a function of rental value * occupancy rate.

⁴⁴ Normally, the discount rate for the residual value is assumed to be lower than that for the cash flow. One approach is to reduce the discount rate by expected average growth after year 10.



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