Grant Thornton AVISON YOUNG

CHANDLERKBS

A CUMMING AFFILIATE

Inflation Report Update

National Transport Authority

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Contents

Appendices

Appendix A – Goodness of Fit Graphic

Appendix B – Indices

Appendix C – Avison Young Capital Value Forecast Report (Including Forecasting Modelling & Measures of Fit)

Version	Status	Prepared by	Checked by	Issue date
001	Final Issue	P O'Hagan	A Humes	20.02.2024

1. Disclaimer

This report has been compiled based on historic price changes, future projections and forecasts up to and including December 2023. It should be considered that historical price data is subject to review, consequently future projections and forecasts may be subject to change at a future date.

In recent years immediately prior to this report, the construction market had experienced a period of price uncertainty, predominately because of the consequences of the Covid-19 recovery, heightened geo-political risks, an energy crisis and economic uncertainty. In the preparation of this report, no further or major shocks are assumed but the macroeconomic and geo-political context will be observed closely and forecasts updated if circumstances warrant it.

Longer term forecasting assumes that the 2% inflationary target set by the European Central Bank is achieved. To achieve this, we assume that there will continue to be ongoing tightening monetary policies and fiscal policies are not inflationary.

It should be noted that this report is intended for use by the National Transport Authority (NTA) and Sponsoring Agencies where the NTA is an Approving Authority.

2. Executive Summary

ChandlerKBS provides independent consultancy services to the National Transport Authority (NTA). Based on proposals presented by ChandlerKBS and accepted by the NTA, ChandlerKBS has produced Tender Price, Cost Price and Land and Property Price Inflation Indices. Grant Thornton (Macroeconomic Consultants) and Avison Young (Land and Property Experts) has supported ChandlerKBS in the delivery of this commission.

In Executive Summary Table 1 we have provided the forecast annual change in Tender Prices for the period 2021 (actual) to 2028 (forecast). These forecasts are presented as a range:

Project Type	Range	2021 Actual	2022[1] Actual	2023 Actual	2024	2025	2026	2027	2028
General	Lower	10.9%	12.7%	4.8%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.3%	3.5%	3.4%	3.4%	3.4%
	Upper				5.2%	4.2%	4.8%	4.8%	4.8%
Highways (Rural)	Lower	10.9%	12.7%	4.8%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.4%	3.5%	3.4%	3.4%	3.4%
	Upper				5.2%	4.3%	4.8%	4.8%	4.8%
Highways (Urban)	Lower	10.1%	12.7%	4.9%	3.9%	3.1%	2.4%	2.4%	2.4%
	Base				4.3%	3.5%	3.4%	3.4%	3.4%
	Upper				5.1%	4.2%	4.8%	4.8%	4.8%
Rail	Lower	10.1%	11.8%	4.5%	3.6%	3.0%	2.2%	2.2%	2.2%
	Base				4.0%	3.3%	3.2%	3.2%	3.2%
	Upper				4.9%	4.0%	4.5%	4.5%	4.5%
Civil Engineering	Lower	14.3%	14.3%	6.1%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.4%	3.5%	3.5%	3.5%	3.5%
	Upper				5.2%	4.2%	4.9%	4.9%	4.9%

Executive Summary Table 1: Forecast Tender Price Inflation (General and Project Type)
Source: Grant Thornton

[1] Indices for 2022 have changed from those included in the report published in 2023. This is due to further reviews of historical cost data that only became available after the report was published. The approach of reviewing historical cost data is common practice and is undertaken by other reputable sources (e.g. Building Cost Information Service).

It is noted that there are substantial changes in the inflationary percentages presented in this table and those published in the inflation report of May 2023. These changes are as a result of prices returning to more stable levels much quicker than anticipated at the time of forecasting in 2023. This reflects the easing pressures around supply chains and the impact of the Central Bank's actions to implement significant increases in interest rates.

In Executive Summary Table 2 we have provided the forecast annual change in Cost Prices for the period 2021 (actual) to 2028 (forecast). These forecasts are also presented as a range:

Project Type	Range	2021 Actual	2022[2] Actual	2023 Actual	2024	2025	2026	2027	2028
Highways (Rural)	Lower	8.6%	10.7%	3.8%	2.4%	1.9%	1.5%	1.5%	1.5%
	Base				2.7%	2.2%	2.2%	2.2%	2.2%
	Upper				3.2%	2.6%	3.0%	3.0%	3.0%
Highways (Urban)	Lower	7.9%	10.7%	3.9%	2.4%	1.9%	1.5%	1.5%	1.5%
	Base				2.7%	2.1%	2.2%	2.2%	2.2%
	Upper				3.2%	2.6%	3.0%	3.0%	3.0%
Civil Engineering	Lower	9.8%	9.4%	4.0%	2.6%	2.1%	1.6%	1.6%	1.6%
	Base				2.9%	2.3%	2.3%	2.3%	2.3%
	Upper				3.5%	2.8%	3.2%	3.2%	3.2%

Executive Summary Table 2: Forecast Cost Price Inflation (Project Type)
Source: Grant Thornton

It is noted that there are also substantial changes in the inflationary percentages presented in this table and those published in the inflation report of May 2023. The reasons for these changes are consistent with the reasons for changes stated in relation to the Tender Price forecasts.

ChandlerKBS has engaged Avison Young to prepare the Land and Property Price forecasts included within this report. Avison Young has used Capital Value forecasts as the basis of its analysis. They have indicated that this represents a 'good proxy' of land costs as the underlying value of land is an integral part of a real estate's capital value. However Avison Young has suggested that when relying upon them, due consideration should be given to

[2] Indices for 2022 have changed from those included in the report published in May 2023. This is due to further reviews of historical cost data that only became available after the report was published. The approach of reviewing historical cost data is common practice and is undertaken by other reputable sources (e.g. Building Cost Information Service).

the full content of its report and in particularly its methodology and caveats. The Capital Value Forecasts prepared by Avison Young are included in Executive Summary Table 3.

Land Type	Range	2021 Actual	2022 Actual	2023[3]	2024	2025	2026	2027	2028
Dublin Residential	Lower	7.3%	10.3%	0.9%	3.4%	2.8%	2.1%	1.5%	0.9%
	Base				6.8%	5.5%	4.3%	3.0%	1.8%
	Upper				10.2%	8.3%	6.4%	4.4%	2.7%
Ireland (Excl. Dublin) Residential	Lower	8.3%	12.3%	1.2%	2.2%	2.1%	1.8%	1.5%	0.6%
	Base				4.4%	4.2%	3.6%	3.0%	1.3%
	Upper				6.5%	6.3%	5.5%	4.5%	1.9%
Office	Lower	0.0%	-6.5%	-13.3%	0.1%	1.5%	1.4%	1.4%	1.5%
	Base				0.2%	3.1%	2.8%	2.8%	2.9%
	Upper				0.4%	6.1%	5.6%	5.6%	5.9%
Industrial	Lower	20.3%	4.1%	-4.1%	1.0%	1.9%	1.2%	1.0%	0.7%
	Base				2.1%	3.8%	2.3%	1.9%	1.5%
	Upper				4.2%	7.7%	4.6%	3.8%	2.9%
Retail	Lower	-6.6%	-6.1%	-7.3%	1.1%	1.4%	0.7%	0.5%	0.2%
	Base				2.2%	2.8%	1.5%	0.9%	0.4%
	Upper				4.4%	5.6%	2.9%	1.8%	0.8%

Executive Summary Table 3: Capital Value Forecasts
Source: Avison Young

[3] The 2023 land values are not currently noted as 'actual'. This is a reflection of the data lag in the land cost information. However, this is observed data and should be considered more robust than future forecasts, which is why it is not being reported as a range.

3. Introduction

ChandlerKBS has been engaged by the NTA to prepare reports on price inflation to include forecasts on the levels of inflation which may be seen during the period from 2024 to 2028.

ChandlerKBS prepared inflation forecasts in early 2023, forecasting future inflation from 2023 to 2027. This report is an update to the report published in May 2023. We have endeavoured to avoid repeating the same/similar information to that included in previous iterations. Instead, ChandlerKBS has focused on providing the following:

- Further information in relation to the forecasting methodology.
- The updated forecasts.
- A brief narrative explaining the changes to the forecasts.

Those reading and relying upon the information contained in this report are assumed to be familiar with the Inflation Report published in May 2023, specifically how that was developed and any assumptions that informed the outputs of that report.

In Table 2, ChandlerKBS has listed the data sources that have been used to inform our forecasting:

Organisation	Database / Variable	Indices Informed
Society of Chartered Surveyors Ireland (SCSI)	Tender Price Index	Tender Prices
Central Statistics Office	Consumer Price Index (CPI)	Tender Prices and Cost Prices
Central Statistics Office	Wholesale Price Index (WPI) - Building and Construction Materials	Cost Prices
Economic & Social Research Institute	Quarterly Economic Commentary – Inflation Forecast	Tender Prices and Cost Prices
Department of Finance	Budget 2024 – Economic & Fiscal Outlook	Tender Prices and Cost Prices
Central Bank of Ireland	Quarterly Bulletin – Inflation Forecasts	Tender Prices and Cost Prices
IMF	World Economic Outlook	Tender Prices and Cost Prices
OECD	Ireland Economic Snapshot	Tender Prices and Cost Prices
EU Commission	Autumn 2023 Economic Forecast – Economic Forecast for Ireland	Tender Prices and Cost Prices
MSCI	Property capital value indices for Dublin offices, retail and industrial	Land & Property Prices
Central Statistics Office (CSO)	Residential property price index (RPPI) for Dublin and Ireland	Land & Property Prices
Oxford Economics	All economic data and forecasts used in the capital value models	Land & Property Prices
Revenue Commissioners	Stamp Duty Returns	Land & Property Prices

Table 1: List of Data Sources
Source: Grant Thornton & Avison Young

4. Tender Price & Cost Price Inflation

4.1. Which Index to Use

Unless otherwise agreed, the NTA requires that the Tender Price Index be used when assessing inflationary allowances for projects where it is the Approving Authority. For guidance on how to use the information and forecasts provided, please refer to the 'NTA Inflation User Guide'.

4.2. Forecasting Modelling & Measures of Fit

ChandlerKBS engaged Grant Thornton to develop the Tender and Cost Price Indices. Grant Thornton developed an inflation forecast model to derive the trend in inflation over the coming years for building and materials and Tender Prices.

To forecast the overall level of inflation for both building materials and Tender Prices, Grant Thornton developed an in-house inflation forecast model. Before noting Grant Thornton's approach, it is important to consider that forecasting is inherently difficult, especially given the number of shocks that the global economy has faced over the last few years. As such, Grant Thornton has increased the frequency of model updates to capture new information and provide revised outputs accordingly.

To test the models, Appendix A presents a 'goodness of fit' graphic that shows published historical plus forecast data and how the forecast model performs if it had been applied in place of published data. This exercise provides comfort that the forecast model is acting appropriately, with the results highlighting an R squared of 77.8% compared to published Tender Price data.

The type of model used was a time-series model, with the model using historical data gathered from the Central Statistics Office (CSO).

Using this historical data, Grant Thornton developed a time-series model which focussed on the relationship between price changes in building materials, macroeconomic factors and Tender Price Inflation. The basis of the model centres around the trend of the Consumer Price Index (CPI) within the Irish economy and the price change in Wholesale Price items, with a specific focus being on construction and building materials.

Data was gathered from the CSO for a range of construction related items including hardwood, concrete, steel, etc. back to the 1975 for CPI and 2015 for the Wholesale Price Index (WPI) for Building and Construction Materials. This data was used to help build and

develop the model. Using this data, Grant Thornton modelled the relationship between each building material item and the overall level of inflation within the economy.

Data for both CPI and WPI was available up to November 2023, the latest data point available at the time the analysis was undertaken. To provide a full year assessment for 2023, Grant Thornton forecasted the remaining month of 2023 CPI and WPI levels, based upon previous years' seasonal trends (which included the impact of Christmas on goods). In doing this Grant Thornton were able to have a full year of inflation for 2023 from which the outlook between 2024 and 2028 was based.

It should be considered the development of the report and updating of the model took around 2 months, with this including data checks, testing and quality assurance. In addition CPI and WPI data is typically lagged by a month and two months respectively, with the next issue expected at the end of January/start of February for the actual December data.

Grant Thornton utilised CPI and HCPI forecasts from a range of forecasters including the ESRI, Department of Finance, Central Bank of Ireland, etc. in order to develop a baseline outlook for inflation levels. This 'consensus view' approach was deemed suitable in an era of significant uncertainty a list of the economic forecasters used can be seen in Table 2.

Organisation	2023	2024	2025	2026	2027
Economic & Social Research Institute (CPI)	6.0%	3.2%			
Department of Finance (HCPI)	5.3%	2.9%	2.4%	1.9%	
Central Bank of Ireland (HCPI)	5.4%	3.2%	2.3%		
IMF (HCPI)	5.2%	3.0%	2.4%	2.0%	2.0%
OECD (HCPI)	5.3%	3.1%	2.6%		
EU Commission (HCPI)	2.7%	2.1%			

Table 2: Inflation Outlook by selection of economic forecasters
Source: ESRI (Quarterly Economic Commentary – Autumn 2023); Department of Finance (Budget 2024 – Economic and Fiscal Outlook); Central Bank of Ireland (Quarterly Bulletin – September 2023); IMF (World Economic Database – October 2023); OECD (Ireland Economic Snapshot – November 2023) and EU Commission (Economic Forecasts for Ireland – Autumn 2023)

It should be noted that over the longer term (post-2025) and in the absence of forecasts, Grant Thornton held the level of inflation flat at 2%, the target level of inflation from the European Central bank (ECB). This was done to reflect how forecasts become less reliable the further into the future they seek to look.

This baseline forecasts, alongside wider market insights from consultations and survey analysis, provided the base outlook and expectations for inflation within the economy. Combining these forecasts and insights with the CPI and WPI relationship produced forecasts for each building and materials item for the period 2024-28. Using these forecasts Grant Thornton were then able to forecast inflation based upon input material growth for each project type as well as overall Tender Price.

Grant Thornton also provided lower and upper bound inflation forecasts through a scenario analysis which captured the impact of a higher for longer inflation environment and the impact of a lower than expected inflation environment. The central scenario acts as the main anchor point for the analysis and represents Grant Thornton's view on what is the most likely path of inflation for building material goods.

Using the Central Scenario, Grant Thornton developed a range of confidence intervals, with these being based upon the inflation forecasts noted above. These confidence intervals were then applied to the Central Scenario to provide both an Upper and Lower Scenario for building materials across the economy from which then overall project type inflation and wider Tender Price forecasts were developed for each scenario.

4.3. Updated Inflation Forecasts

Grant Thornton produced Tender Price and Cost Price Indices, which are provided in Tables 3 and 4 respectively:

Project Type	Range	2021 Actual	2022[4] Actual	2023 Actual	2024	2025	2026	2027	2028
General	Lower	10.9%	12.7%	4.8%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.3%	3.5%	3.4%	3.4%	3.4%
	Upper				5.2%	4.2%	4.8%	4.8%	4.8%
Highways (Rural)	Lower	10.9%	12.7%	4.8%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.4%	3.5%	3.4%	3.4%	3.4%
	Upper				5.2%	4.3%	4.8%	4.8%	4.8%
Highways (Urban)	Lower	10.1%	12.7%	4.9%	3.9%	3.1%	2.4%	2.4%	2.4%
	Base				4.3%	3.5%	3.4%	3.4%	3.4%
	Upper				5.1%	4.2%	4.8%	4.8%	4.8%
Rail	Lower	10.1%	11.8%	4.5%	3.6%	3.0%	2.2%	2.2%	2.2%
	Base				4.0%	3.3%	3.2%	3.2%	3.2%
	Upper				4.9%	4.0%	4.5%	4.5%	4.5%
Civil Engineering	Lower	14.3%	14.3%	6.1%	3.9%	3.2%	2.4%	2.4%	2.4%
	Base				4.4%	3.5%	3.5%	3.5%	3.5%
	Upper				5.2%	4.2%	4.9%	4.9%	4.9%

Table 3: Forecast Tender Price Inflation (General and Project Type)
Source: Grant Thornton

Project Type	Range	2021 Actual	2022[4] Actual	2023 Actual	2024	2025	2026	2027	2028
Highways (Rural)	Lower	8.6%	10.7%	3.8%	2.4%	1.9%	1.5%	1.5%	1.5%
	Base				2.7%	2.2%	2.2%	2.2%	2.2%
	Upper				3.2%	2.6%	3.0%	3.0%	3.0%
Highways (Urban)	Lower	7.9%	10.7%	3.9%	2.4%	1.9%	1.5%	1.5%	1.5%
	Base				2.7%	2.1%	2.2%	2.2%	2.2%
	Upper				3.2%	2.6%	3.0%	3.0%	3.0%
Civil Engineering	Lower	9.8%	9.4%	4.0%	2.6%	2.1%	1.6%	1.6%	1.6%
	Base				2.9%	2.3%	2.3%	2.3%	2.3%
	Upper				3.5%	2.8%	3.2%	3.2%	3.2%

Table 4: Forecast Cost Price Inflation (Project Type)
Source: Grant Thornton

[4] Indices for 2022 have changed from those included in the report published in 2023. This is due to further reviews of historical cost data that only became available after the report was published. The approach of reviewing historical cost data is common practice and is undertaken by other reputable sources (e.g. Building Cost Information Service).

Long term inflation forecasts are included in Appendix B. Beyond a five year horizon, forecasts for inflation revert to the European Central Bank target of 2% per annum. This reflects that forecasts are increasingly uncertain the further forward they look.

4.4. What has Changed?

ChandlerKBS consider it prudent to note that there are substantial changes in the inflationary percentages presented in Tables 3 and 4, compared with those published in the inflation report of May 2023. These changes are as a result of prices returning to more stable levels much quicker than anticipated at the time of forecasting in 2023. This reflects the easing pressures around supply chains, which resolved faster than anticipated, and the impact of the Central Bank's actions to implement significant increases in interest rates.

Tender Prices

For context, and to understand just how volatile recent price changes have been, Figure 1 below shows the Society if Chartered Surveyors Ireland (SCSI) Tender Price Index for the period between H1 2011 and H2 2023. As can be seen from Figure 1 below, the level of tender price index has risen significantly over the past decade. In fact, the price for tenders has more than doubled (104.7%) between H1 2011 and H2 2023. Much of this rise has occurred in the last couple of years, with rising labour and material costs contributing to the increased pace of increases. Reflecting the recent rise in prices, tender prices have grown by 10.9% in 2021 and by a further 12.7% in 2022, whereas previously, between 2012 and 2020, growth averaged 5.0% per annum. However more recently the level of growth has tapered off, with growth between H1 2022 and H1 2023 being 6.2% in comparison the annual growth averaged 11.8% across the period H1 2021 to H2 2022.

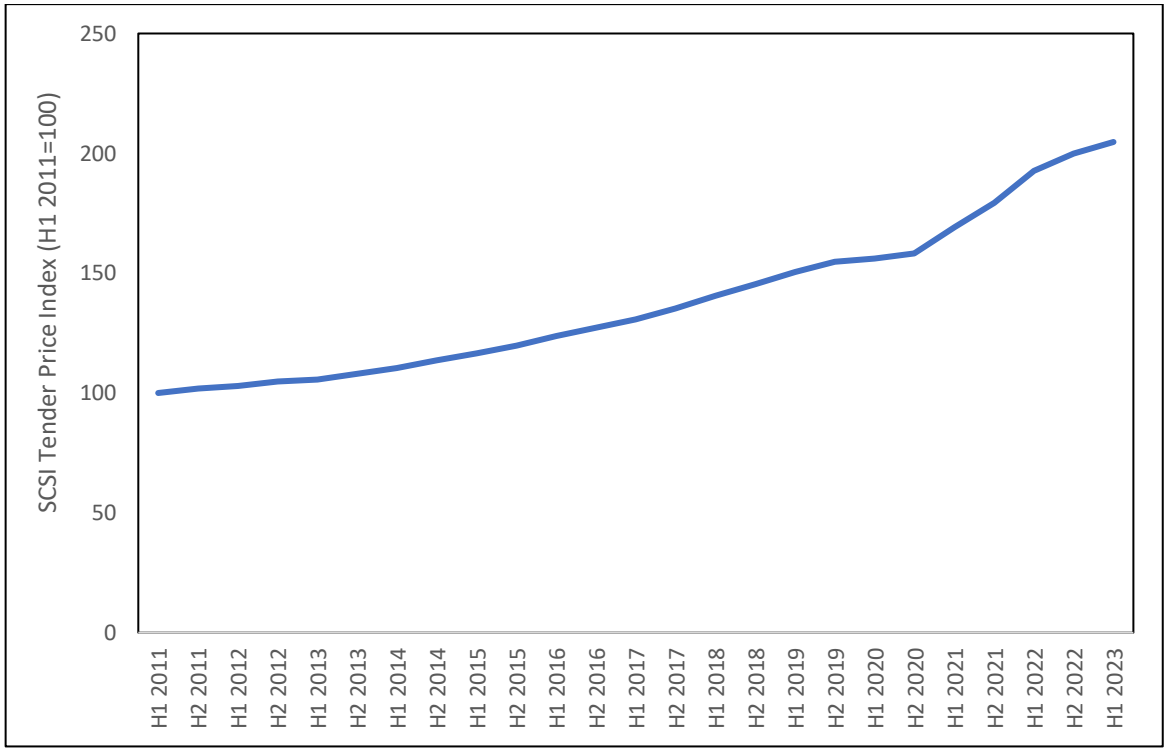


Figure 1: SCSI Tender Price Index (H1 2011=100), 2011-2023
Source: Society of Chartered Surveyors Ireland

The easing in the rate of growth of Tender Prices referenced above is a positive development after the past couple of years' sharp growth in prices driven by rising material costs and rising labour costs. This 'easing' shows that the market and price increases are returning to some normality and that price stability could be returning.

It should be considered that the growth between H1 2022 and H1 2023 stood at 6.2% remaining in excess of the average prior to 2020 (5%). Analysis of the Wholesale Price Index for building and construction materials relative to the SCSI Tender Price Index shows that in recent years much of the rise in tender prices correlate with material price rises. For example, between H1 2020 and H1 2023, the cost of materials rose by 14.7%, which has at least in part led to the level of Tender Prices rising by 21.0% over the same period.

Grant Thornton's assessment highlights there is a strong correlation between the level of building material price changes and the rise in Tender prices. In fact, when assessing the relationship between building material price changes to Tender Prices historically our analysis shows that there is a very strong relationship, with the R squared standing at 90.3%. As such, changes in materials costs up or down will invariably transfer to the cost of Tenders.

Therefore, our forecast suggests Tender Prices as a result of easing materials costs will grow by 4.3% in 2024. Growth rates in Tender Prices will ease further as material growth eases in 2025 and beyond, with growth in 2025 expected to be 3.5%, before dropping back to 3.4% over the longer term.

A limitation associated with this report is that it focuses primarily on the inflationary/deflationary outputs. We would recommend that consideration should be afforded to conducting a detailed industrial analysis that is specific to the construction sector. This analysis would assist in helping to explain why there has been such a rapid stabilisation of construction prices, considering factors such as the contracting market, competition, market regulation etc.

Material Prices

Given the significance of how varying levels of material inputs will influence total project costs, Grant Thornton has profiled inflation for a selection of 40 construction material components. During 2024, our analysis predicts an increase of 3.1%. However, over the longer term, while it is anticipated that prices will continue to grow (a reflection of the post-recovery world, coupled with sustained demand from Ireland 2040, etc), we predict longer-term growth with 2.4% per annum between 2025 and 2028, with this only slightly above the forecast expectations for Ireland from the Department of Finance and IMF.

Description	2022 Actual	2023 Actual	2024	2025	2026	2027	2028
Building and Construction Material Price Forecast	11.4%	3.4%	3.1%	2.5%	2.4%	2.4%	2.4%

Table 5: Material Costs Price Inflation Forecast, 2022-2028
Source: Grant Thornton Economic Forecast

Cost Prices

Turning to a disaggregation of construction material inputs, Grant Thornton expect that the outlook will continue to be dominated by the level of supply chain disruption and demand impacts. Table 6 below shows the level of cost inflation by each of the construction and material components assessed for this study.

Based upon our forecasts, we expect that the level of building and cost material inflation will peak at 3.1% in 2024. However, over the longer-term we forecast that as the period of high inflation nationally and globally eases and businesses adjust and supply chain pressures ease, the level of material cost inflation will fall back to an average level of 2.4% per annum.

Cost Input	2022 Actual	2023 Actual	2024	2025	2026	2027	2028
1) People Costs	3.7%	2.0%	0.9%	0.8%	0.8%	0.8%	0.8%
2) Professional Services	11.2%	6.1%	2.9%	2.5%	2.5%	2.5%	2.5%
3) Equipment	8.5%	2.8%	2.8%	2.2%	2.4%	2.4%	2.4%
4) Aggregates	9.0%	4.7%	2.9%	2.2%	2.5%	2.5%	2.5%
5) Cement and Ready Mixed Products	14.7%	7.9%	3.2%	2.5%	2.6%	2.6%	2.6%
6) Bituminous Products	16.8%	2.1%	2.6%	2.0%	2.3%	2.3%	2.3%
7) Plastic Products	22.6%	5.6%	3.7%	3.0%	2.9%	2.9%	2.9%
8) Fuel / Transportation Costs	9.4%	6.4%	3.9%	3.5%	2.1%	2.1%	2.1%
9) Timber	5.3%	-14.4%	3.2%	2.5%	2.6%	2.6%	2.6%
10) Steel	8.1%	2.0%	4.3%	3.5%	3.2%	3.2%	3.2%
11) PC Concrete	18.9%	9.1%	3.8%	3.0%	3.0%	3.0%	3.0%
12) Other Materials	12.2%	5.2%	3.1%	2.4%	2.6%	2.6%	2.6%
13) Site Overheads	8.1%	4.8%	2.6%	2.3%	1.8%	1.8%	1.8%

Table 6: Cost Price Inflation Forecast, 2022-2028
Source: Grant Thornton Economic Forecast

For a more in-depth understanding into how the level of cost inflation outlined in Table 6 above plays into construction projects, we have applied these costs to the Project Types; Highways Sector Only (Rural), Highways Sector (Urban) and Civil Engineering Sector Only (Non-Roads and Heavy Infrastructure). Our forecasts suggest that based upon the relative composition of project costs:

- Highways Sector Only (Rural) will see costs grow by 2.7% in 2024 before falling back to a more 'stable' level of 2.2% in 2025 and beyond.
- Highways Sector Only (Urban) will increase by 2.7% in 2024, before falling back to 2.2% in 2025.
- Civil Engineering projects, will see a price inflation of 2.9% in 2024, before dropping back to 2.3% over the longer term (2025-28).

5. Land & Property Price Inflation

5.1. Engagement of Avison Young

ChandlerKBS engaged Avison Young to develop the Land and Property Price Indices for this report. Avison Young has prepared an in-depth report that clearly identifies its data sources, forecasting modelling and measures of fit, inflation forecasts and assumptions and caveats.

Those relying on these inflationary forecasts are expected to familiarise themselves with the Avison Young report, which is included in Appendix C.

5.2. Forecasting Modelling & Measures of Fit

Forecasting is an inherently uncertain activity, which is subject to unexpected changes in the macro-economic and geo-political environment. Events that are unknown at the time of the forecast exercise, undertaken in December 2023 and early January 2024, or were viewed as low risk at the time but subsequently escalated, could significantly impact the forecast outcome.

Avison Young carried out visual inspections of the data with correlation analysis to identify likely relationships between the capital value indices and "independent" variables for which 5-year forecasts were available, which were therefore used in the Avison Young model.

Avison Young built regression models to forecast future changes in the indices over the forecast period 2024 to 2028.

Variables identified by Grant Thornton were tested individually and in combination to assess their explanatory power and thus suitability for inclusion in the final set of models. Variables were also tested contemporaneously and using various positive or negative time lags.

The final models chosen by Avison Young were those that displayed the highest R-squared statistic: The R2 displays the explanatory power of the variables to account for variation in capital values. For example, an R2 of 0.7 means that the variables included in the analysis (regression) explain 70% of the historical variation in residential/ commercial price indices.

5.3. Updated Inflation Forecasts

Avison Young produced Land & Property Price Inflationary Forecasts which are explained in detail within its report in Appendix C. These forecasts are provided in Table 7:

Land Type	Range	2021 Actual	2022 Actual	2023	2024	2025	2026	2027	2028
Dublin Residential	Lower	7.3%	10.3%	0.9%	3.4%	2.8%	2.1%	1.5%	0.9%
	Base				6.8%	5.5%	4.3%	3.0%	1.8%
	Upper				10.2%	8.3%	6.4%	4.4%	2.7%
Ireland (Excl. Dublin) Residential	Lower	8.3%	12.3%	1.2%	2.2%	2.1%	1.8%	1.5%	0.6%
	Base				4.4%	4.2%	3.6%	3.0%	1.3%
	Upper				6.5%	6.3%	5.5%	4.5%	1.9%
Office	Lower	0.0%	-6.5%	-13.3%	0.1%	1.5%	1.4%	1.4%	1.5%
	Base				0.2%	3.1%	2.8%	2.8%	2.9%
	Upper				0.4%	6.1%	5.6%	5.6%	5.9%
Industrial	Lower	20.3%	4.1%	-4.1%	1.0%	1.9%	1.2%	1.0%	0.7%
	Base				2.1%	3.8%	2.3%	1.9%	1.5%
	Upper				4.2%	7.7%	4.6%	3.8%	2.9%
Retail	Lower	-6.6%	-6.1%	-7.3%	1.1%	1.4%	0.7%	0.5%	0.2%
	Base				2.2%	2.8%	1.5%	0.9%	0.4%
	Upper				4.4%	5.6%	2.9%	1.8%	0.8%

Table 7: Land & Property Capital Value Forecasts
Source: Avison Young

6. Methodology for Calculating Inflationary Allowances in Cost Estimates

6.1. User Guide & Worked Examples

The NTA has provided a detailed user guide and worked examples as part of the 2023 publication of the inflation forecasts. These user guides are still applicable. However, those estimating the cost of inflation are expected to consider the most recent inflationary forecasts as part of their assessments.

7. Inflation Ranges

7.1. Reporting Inflation as a Range

It may be appropriate to report some projects in a range (e.g. larger programmes of work such as BusConnects), where completion of the project is programmed several years after the base date of the estimate, or alternatively, it may be part of an Organisation's policy to report cost estimates in a range. For example, the following terminology has been used in the expression of a range:

- Target Cost – The projected final outturn cost achievable if realistic risks and inflation materialise.
- Total Scheme Budget – The potential project final outturn cost achievable where Exceptional Risks and TII Programme Risk materialises.

In instances where a range is being reported, it is our opinion that the estimator should use the lower and upper boundary of the inflation forecast from the relevant sector.

7.2. Reporting Inflation as a Single Point Estimate

The alternative to reporting inflation as a range is to prepare a single point estimate for inflation. This is particularly the case where projects will be completed in the short to medium term (i.e within 2 years of the estimate being produced), the scope and nature of the project is relatively straight forward, or alternatively, where it is an Organisation's policy. The NTA's Cost Management Guidelines currently require the production of a single point estimate for inflation, however it has adopted the 'range approach' where has been considered appropriate (e.g. BusConnects).

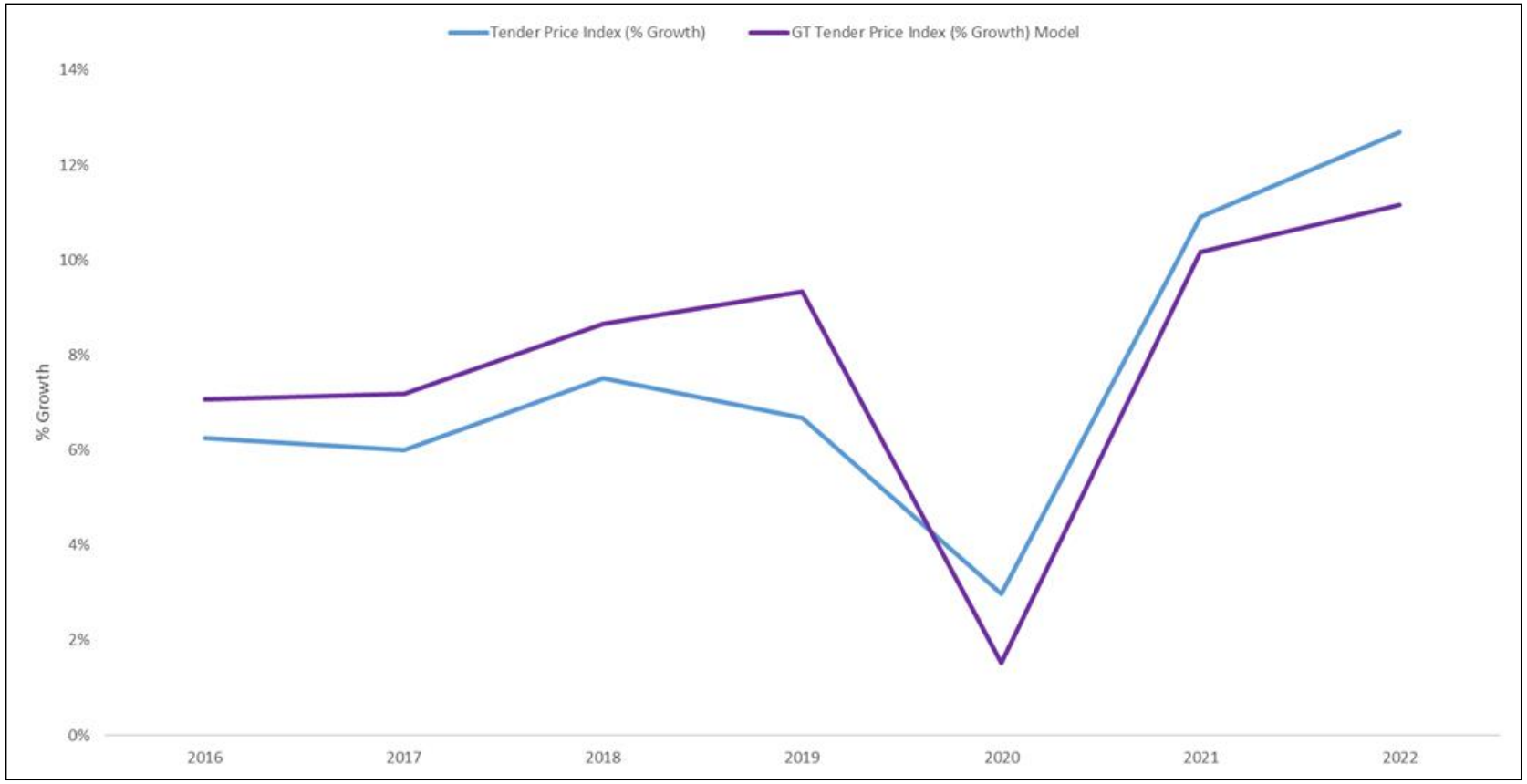
When an organisation report inflation as a single point estimate, we would suggest using the base inflation data for the relevant sector.

Appendix A

Goodness of Fit Graphic

The chart set out below shows the prediction capability of the model relative to published Tender Price Index data from the Society of Chartered Surveyors Ireland. The chart shows actual published data and modelled data where Grant Thornton's model is applied to 2015 data. From this analysis, the trend predicted by the model follows the trend in Tender Price Growth, with relative consistency.

In terms of the reliability of the model to predict trends when comparing the above the model showed an R-squared value of 77.6% between the official figures produced by the SCSI and the modelled trend.



Appendix A1: Tender Price Inflation Data vs. Predicted Model Trend, 2016-2022

Appendix B

Indices

Cost Price Index - 2024 Issue

	Highways Rural					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	108.60	8.60%	108.60	8.60%	108.60	8.60%
2022	120.22	10.70%	120.22	10.70%	120.22	10.70%
2023	124.79	3.80%	124.79	3.80%	124.79	3.80%
2024	127.78	2.40%	128.16	2.70%	128.78	3.20%
2025	130.21	1.90%	130.98	2.20%	132.13	2.60%
2026	132.16	1.50%	133.86	2.20%	136.09	3.00%
2027	134.15	1.50%	136.80	2.20%	140.18	3.00%
2028	136.16	1.50%	139.81	2.20%	144.38	3.00%
2029	138.88	2.00%	142.61	2.00%	147.27	2.00%
2030	141.66	2.00%	145.46	2.00%	150.22	2.00%
2031	144.49	2.00%	148.37	2.00%	153.22	2.00%
2032	147.38	2.00%	151.34	2.00%	156.28	2.00%
2033	150.33	2.00%	154.37	2.00%	159.41	2.00%
2034	153.34	2.00%	157.45	2.00%	162.60	2.00%
2035	156.40	2.00%	160.60	2.00%	165.85	2.00%
2036	159.53	2.00%	163.81	2.00%	169.17	2.00%
2037	162.72	2.00%	167.09	2.00%	172.55	2.00%
2038	165.98	2.00%	170.43	2.00%	176.00	2.00%
2039	169.30	2.00%	173.84	2.00%	179.52	2.00%
2040	172.68	2.00%	177.32	2.00%	183.11	2.00%

	Highways Urban					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	107.90	7.90%	107.90	7.90%	107.90	7.90%
2022	119.45	10.70%	119.45	10.70%	119.45	10.70%
2023	124.10	3.90%	124.10	3.90%	124.10	3.90%
2024	127.08	2.40%	127.45	2.70%	128.07	3.20%
2025	129.50	1.90%	130.13	2.10%	131.40	2.60%
2026	131.44	1.50%	132.99	2.20%	135.35	3.00%
2027	133.41	1.50%	135.92	2.20%	139.41	3.00%
2028	135.41	1.50%	138.91	2.20%	143.59	3.00%
2029	138.12	2.00%	141.69	2.00%	146.46	2.00%
2030	140.88	2.00%	144.52	2.00%	149.39	2.00%
2031	143.70	2.00%	147.41	2.00%	152.38	2.00%
2032	146.57	2.00%	150.36	2.00%	155.43	2.00%
2033	149.51	2.00%	153.37	2.00%	158.53	2.00%
2034	152.50	2.00%	156.44	2.00%	161.71	2.00%
2035	155.55	2.00%	159.56	2.00%	164.94	2.00%
2036	158.66	2.00%	162.76	2.00%	168.24	2.00%
2037	161.83	2.00%	166.01	2.00%	171.60	2.00%
2038	165.07	2.00%	169.33	2.00%	175.04	2.00%
2039	168.37	2.00%	172.72	2.00%	178.54	2.00%
2040	171.74	2.00%	176.17	2.00%	182.11	2.00%

	Civil Engineering					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	109.80	9.80%	109.80	9.80%	109.80	9.80%
2022	120.12	9.40%	120.12	9.40%	120.12	9.40%
2023	124.93	4.00%	124.93	4.00%	124.93	4.00%
2024	128.17	2.60%	128.55	2.90%	129.30	3.50%
2025	130.87	2.10%	131.51	2.30%	132.92	2.80%
2026	132.96	1.60%	134.53	2.30%	137.17	3.20%
2027	135.09	1.60%	137.62	2.30%	141.56	3.20%
2028	137.25	1.60%	140.79	2.30%	146.09	3.20%
2029	139.99	2.00%	143.61	2.00%	149.01	2.00%
2030	142.79	2.00%	146.48	2.00%	151.99	2.00%
2031	145.65	2.00%	149.41	2.00%	155.03	2.00%
2032	148.56	2.00%	152.40	2.00%	158.13	2.00%
2033	151.53	2.00%	155.44	2.00%	161.30	2.00%
2034	154.56	2.00%	158.55	2.00%	164.52	2.00%
2035	157.66	2.00%	161.72	2.00%	167.81	2.00%
2036	160.81	2.00%	164.96	2.00%	171.17	2.00%
2037	164.02	2.00%	168.26	2.00%	174.59	2.00%
2038	167.31	2.00%	171.62	2.00%	178.08	2.00%
2039	170.65	2.00%	175.05	2.00%	181.65	2.00%
2040	174.06	2.00%	178.56	2.00%	185.28	2.00%

Tender Price Index - 2024 Issue

	General					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	110.90	10.90%	110.90	10.90%	110.90	10.90%
2022	124.98	12.70%	124.98	12.70%	124.98	12.70%
2023	130.98	4.80%	130.98	4.80%	130.98	4.80%
2024	136.09	3.90%	136.62	4.30%	137.79	5.20%
2025	140.45	3.20%	141.40	3.50%	143.58	4.20%
2026	143.82	2.40%	146.20	3.40%	150.47	4.80%
2027	147.27	2.40%	151.18	3.40%	157.70	4.80%
2028	150.80	2.40%	156.32	3.40%	165.27	4.80%
2029	153.82	2.00%	159.44	2.00%	168.57	2.00%
2030	156.90	2.00%	162.63	2.00%	171.94	2.00%
2031	160.03	2.00%	165.88	2.00%	175.38	2.00%
2032	163.23	2.00%	169.20	2.00%	178.89	2.00%
2033	166.50	2.00%	172.59	2.00%	182.47	2.00%
2034	169.83	2.00%	176.04	2.00%	186.12	2.00%
2035	173.23	2.00%	179.56	2.00%	189.84	2.00%
2036	176.69	2.00%	183.15	2.00%	193.64	2.00%
2037	180.22	2.00%	186.81	2.00%	197.51	2.00%
2038	183.83	2.00%	190.55	2.00%	201.46	2.00%
2039	187.51	2.00%	194.36	2.00%	205.49	2.00%
2040	191.26	2.00%	198.25	2.00%	209.60	2.00%

	Highways Rural					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	110.90	10.90%	110.90	10.90%	110.90	10.90%
2022	124.98	12.70%	124.98	12.70%	124.98	12.70%
2023	130.98	4.80%	130.98	4.80%	130.98	4.80%
2024	136.09	3.90%	136.75	4.40%	137.79	5.20%
2025	140.45	3.20%	141.53	3.50%	143.72	4.30%
2026	143.82	2.40%	146.35	3.40%	150.62	4.80%
2027	147.27	2.40%	151.32	3.40%	157.85	4.80%
2028	150.80	2.40%	156.47	3.40%	165.42	4.80%
2029	153.82	2.00%	159.60	2.00%	168.73	2.00%
2030	156.90	2.00%	162.79	2.00%	172.11	2.00%
2031	160.03	2.00%	166.04	2.00%	175.55	2.00%
2032	163.23	2.00%	169.36	2.00%	179.06	2.00%
2033	166.50	2.00%	172.75	2.00%	182.64	2.00%
2034	169.83	2.00%	176.21	2.00%	186.30	2.00%
2035	173.23	2.00%	179.73	2.00%	190.02	2.00%
2036	176.69	2.00%	183.32	2.00%	193.82	2.00%
2037	180.22	2.00%	186.99	2.00%	197.70	2.00%
2038	183.83	2.00%	190.73	2.00%	201.65	2.00%
2039	187.51	2.00%	194.55	2.00%	205.68	2.00%
2040	191.26	2.00%	198.44	2.00%	209.80	2.00%

	Highways Urban					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	110.10	10.10%	110.10	10.10%	110.10	10.10%
2022	124.08	12.70%	124.08	12.70%	124.08	12.70%
2023	130.16	4.90%	130.16	4.90%	130.16	4.90%
2024	135.24	3.90%	135.76	4.30%	136.80	5.10%
2025	139.43	3.10%	140.51	3.50%	142.55	4.20%
2026	142.78	2.40%	145.29	3.40%	149.39	4.80%
2027	146.20	2.40%	150.23	3.40%	156.56	4.80%
2028	149.71	2.40%	155.34	3.40%	164.07	4.80%
2029	152.71	2.00%	158.44	2.00%	169.65	3.40%
2030	155.76	2.00%	161.61	2.00%	173.05	2.00%
2031	158.88	2.00%	164.84	2.00%	176.51	2.00%
2032	162.05	2.00%	168.14	2.00%	180.04	2.00%
2033	165.30	2.00%	171.50	2.00%	183.64	2.00%
2034	168.60	2.00%	174.93	2.00%	187.31	2.00%
2035	171.97	2.00%	178.43	2.00%	191.06	2.00%
2036	175.41	2.00%	182.00	2.00%	194.88	2.00%
2037	178.92	2.00%	185.64	2.00%	198.78	2.00%
2038	182.50	2.00%	189.35	2.00%	202.75	2.00%
2039	186.15	2.00%	193.14	2.00%	206.81	2.00%
2040	189.87	2.00%	197.00	2.00%	210.94	2.00%

	Irish Rail					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	110.10	10.10%	110.10	10.10%	110.10	10.10%
2022	123.09	11.80%	123.09	11.80%	123.09	11.80%
2023	128.63	4.50%	128.63	4.50%	128.63	4.50%
2024	133.26	3.60%	133.78	4.00%	134.93	4.90%
2025	137.26	3.00%	138.19	3.30%	140.33	4.00%
2026	140.28	2.20%	142.61	3.20%	146.65	4.50%
2027	143.37	2.20%	147.18	3.20%	153.25	4.50%
2028	146.52	2.20%	151.89	3.20%	160.14	4.50%
2029	149.45	2.00%	154.92	2.00%	163.34	2.00%
2030	152.44	2.00%	158.02	2.00%	166.61	2.00%
2031	155.49	2.00%	161.18	2.00%	169.94	2.00%
2032	158.60	2.00%	164.41	2.00%	173.34	2.00%
2033	161.77	2.00%	167.69	2.00%	176.81	2.00%
2034	165.00	2.00%	171.05	2.00%	180.35	2.00%
2035	168.30	2.00%	174.47	2.00%	183.95	2.00%
2036	171.67	2.00%	177.96	2.00%	187.63	2.00%
2037	175.10	2.00%	181.52	2.00%	191.38	2.00%
2038	178.61	2.00%	185.15	2.00%	195.21	2.00%
2039	182.18	2.00%	188.85	2.00%	199.12	2.00%
2040	185.82	2.00%	192.63	2.00%	203.10	2.00%

	Civil Engineering					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	114.30	14.30%	114.30	14.30%	114.30	14.30%
2022	130.64	14.30%	130.64	14.30%	130.64	14.30%
2023	138.61	6.10%	138.61	6.10%	138.61	6.10%
2024	144.02	3.90%	144.71	4.40%	145.82	5.20%
2025	148.63	3.20%	149.78	3.50%	151.95	4.20%
2026	152.20	2.40%	155.02	3.50%	159.39	4.90%
2027	155.85	2.40%	160.45	3.50%	167.20	4.90%
2028	159.59	2.40%	166.06	3.50%	175.40	4.90%
2029	162.78	2.00%	169.38	2.00%	178.90	2.00%
2030	166.04	2.00%	172.77	2.00%	182.48	2.00%
2031	169.36	2.00%	176.23	2.00%	186.13	2.00%
2032	172.74	2.00%	179.75	2.00%	189.85	2.00%
2033	176.20	2.00%	183.35	2.00%	193.65	2.00%
2034	179.72	2.00%	187.01	2.00%	197.52	2.00%
2035	183.32	2.00%	190.75	2.00%	201.47	2.00%
2036	186.98	2.00%	194.57	2.00%	205.50	2.00%
2037	190.72	2.00%	198.46	2.00%	209.61	2.00%
2038	194.54	2.00%	202.43	2.00%	213.81	2.00%
2039	198.43	2.00%	206.48	2.00%	218.08	2.00%
2040	202.40	2.00%	210.61	2.00%	222.44	2.00%

Land & Property Price Index - 2024 Issue

	Dublin Residential					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	107.30	7.3%	107.30	7.3%	107.30	7.3%
2022	118.40	10.3%	118.40	10.3%	118.40	10.3%
2023	119.47	0.9%	119.47	0.9%	119.47	0.9%
2024	123.53	3.4%	127.59	6.8%	131.65	10.2%
2025	126.99	2.8%	134.61	5.5%	142.58	8.3%
2026	129.65	2.1%	140.39	4.3%	151.70	6.4%
2027	131.60	1.5%	144.61	3.0%	158.38	4.4%
2028	132.78	0.9%	147.21	1.8%	162.65	2.7%

	Irish (Excluding Dublin) Residential					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	108.30	8.3%	108.30	8.3%	108.30	8.3%
2022	121.60	12.3%	121.60	12.3%	121.60	12.3%
2023	123.06	1.2%	123.06	1.2%	123.06	1.2%
2024	125.77	2.2%	128.47	4.4%	131.06	6.5%
2025	128.41	2.1%	133.87	4.2%	139.31	6.3%
2026	130.72	1.8%	138.69	3.6%	146.98	5.5%
2027	132.68	1.5%	142.85	3.0%	153.59	4.5%
2028	133.48	0.6%	144.71	1.3%	156.51	1.9%

	Office Market					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	100.00	0.0%	100.00	0.0%	100.00	0.0%
2022	93.50	-6.5%	93.50	-6.5%	93.50	-6.5%
2023	81.06	-13.3%	81.06	-13.3%	81.06	-13.3%
2024	81.15	0.1%	81.23	0.2%	81.39	0.4%
2025	82.36	1.5%	83.74	3.1%	86.35	6.1%
2026	83.52	1.4%	86.09	2.8%	91.19	5.6%
2027	84.69	1.4%	88.50	2.8%	96.30	5.6%
2028	85.96	1.5%	91.07	2.9%	101.98	5.9%

	Industrial Market					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	120.30	20.3%	120.30	20.3%	120.30	20.3%
2022	125.20	4.1%	125.20	4.1%	125.20	4.1%
2023	120.07	-4.1%	120.07	-4.1%	120.07	-4.1%
2024	121.27	1.0%	122.59	2.1%	125.11	4.2%
2025	123.57	1.9%	127.25	3.8%	134.74	7.7%
2026	125.05	1.2%	130.17	2.3%	140.94	4.6%
2027	126.30	1.0%	132.65	1.9%	146.30	3.8%
2028	127.19	0.7%	134.64	1.5%	150.54	2.9%

	Retail Market					
	Lower		Base		Upper	
Year	Indice	Annual Increase	Indice	Annual Increase	Indice	Annual Increase
2020	100.00		100.00		100.00	
2021	93.40	-6.6%	93.40	-6.6%	93.40	-6.6%
2022	87.70	-6.1%	87.70	-6.1%	87.70	-6.1%
2023	81.30	-7.3%	81.30	-7.3%	81.30	-7.3%
2024	82.19	1.1%	83.09	2.2%	84.88	4.4%
2025	83.34	1.4%	85.41	2.8%	89.63	5.6%
2026	83.93	0.7%	86.69	1.5%	92.23	2.9%
2027	84.35	0.5%	87.47	0.9%	93.89	1.8%
2028	84.51	0.2%	87.82	0.4%	94.64	0.8%

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Appendix C

Avison Young Capital Value Forecast Report (Including Forecasting Modelling & Measures of Fit)

AVISON YOUNG

Irish Real Estate

Capital Value Index Forecasts

February 2024 Update

Contents

Annexes

1. Introduction

1.1 Avison Young has been instructed by ChandlerKBS to prepare 5-year forecasts of changes in commercial and residential property values in Dublin and the wider Irish real estate market. This report is an update to the report provided by Avison Young in February 2023. It updates the forecasts and extends the forecasting period to 2028, from 2027 previously.

1.2 We understand that the objective is to inform an understanding of likely changes in land values over the coming 5 years. However, forecasting is an inherently uncertain activity, which is subject to unexpected changes in the macro- economic and geo-political environment. Events that are unknown at the time of the forecast exercise, undertaken in December 2023 and early January 2024, or were viewed as low risk at the time but subsequently escalated, could significantly impact the forecast outcome.

1.3 It should be noted that the forecasts included in this report do not represent any form of valuation advice in relation to any individual or group of properties and should not be interpreted as such. The forecasts are derived from an analysis of the historic movement in various published indices of capital values relative to a variety of economic indicators. They are subject to important caveats, assumptions and limitations which are set out elsewhere in this report.

1.4 Due to limitations on data availability, it has not been possible to produce direct forecasts of future movements in land values. To overcome the limitations referred to, it would require reliable time series data on land values (in terms of data quality and most importantly in terms of the number of historical observations/years that the index covers). We provide a qualitative commentary on the relationship between capital values and land values in Section 10 below.

1.5 Due to similar limitations on the availability of robust, consistent and published real estate market data, the forecasts are based solely on the relationship between the capital value indices and wider economic indicators. They take no direct account of current real estate supply/demand issues. Whilst these are likely to have a very significant effect on short term (1-3 year) movements in values, and thus the shape of the forecast, we have assumed that over a five-year period demand will be determined by the underlying economic drivers, with market supply and capital values adjusting accordingly. Where appropriate we have provided commentary on the potential impact of short-term supply-demand factors on the forecasts produced.

1.6 We would explicitly draw the reader's attention to important caveats, assumptions and warranties regarding the accuracy and application of the forecasts contained in Section 3 of this report.

2. Summary of Forecast Results

2.1 The forecast results from the baseline economic scenario models for each sector analysed are set out below. The results are discussed in more detail in the relevant sections of the report.

2.2 In each table an * next to the forecast denotes model output was adjusted as explained in the text

Dublin Residential	Baseline scenario	Upside	Downside
2023	0.9%	0.9%	0.9%
2024	6.8%	10.2%*	3.4%
2025	5.5%	8.3%*	2.8%
2026	4.3%	6.4%*	2.1%
2027	3.0%	4.4%*	1.5%
2028	1.8%	2.7%*	0.9%
Average 2014-23	7.5%	7.5%	7.5%
Average 2024-28	**4.3%**	**6.4%***	**2.1%**
Cumulative 2021-23	19.5%	19.5%	19.5%
Cumulative 2024-28	**23.1%**	**36.1%***	**11.1%**

Irish Residential	Baseline scenario	Upside	Downside
2023	1.2%	1.2%	1.2%
2024	4.4%*	6.5%*	2.2%
2025	4.2%*	6.3%*	2.1%
2026	3.6%*	5.5%*	1.8%
2027	3.0%*	4.5%*	1.5%
2028	1.3%	1.9%*	0.6%
Average 2014-23	8.1%	8.1%	8.1%
Average 2024-28	3.3%*	4.9%*	1.6%
Cumulative 2021-23	23.1%	23.1%	23.1%
Cumulative 2024-28	17.5%*	27.1%*	8.5%

Dublin Offices	Baseline scenario	Upside	Downside
2023	-13.3%	-13.3%	-13.3%
2024	0.2%	0.4%	0.1%
2025	3.1%	6.1%	1.5%
2026	2.8%	5.6%	1.4%
2027	2.8%	5.6%	1.4%
2028	2.9%	5.9%	1.5%
Average 2014-23	5.1%	5.1%	5.1%
Average 2024-28	**2.4%**	**4.7%**	**1.2%**
Cumulative 2021-23	-19.2%	-19.2	-19.2
Cumulative 2024-28	**12.4%**	**25.9%**	**6.0%**

Dublin Industrial	Baseline scenario	Upside	Downside
2023	-4.1%	-4.1%	-4.1%
2024	2.1%*	4.2%	1.0%
2025	3.8%*	7.7%	1.9%
2026	2.3%*	4.6%	1.2%
2027	1.9%*	3.8%	1.0%
2028	1.5%*	2.9%	0.7%
Average 2014-23	6.1%	6.1%	6.1%
Average 2024-28	**2.3%***	**4.6%**	**1.2%**
Cumulative 2021-23	20.1%	20.1	20.1
Cumulative 2024-28	**12.2%***	**25.4%**	**5.9%**

Dublin Retail	Baseline scenario	Upside	Downside
2023	-7.3%	-7.3%	-7.3%
2024	2.2%*	4.4%	1.1%
2025	2.8%*	5.6%	1.4%
2026	1.5%*	2.9%	0.7%
2027	0.9%*	1.8%	0.5%
2028	0.4%*	0.8%	0.2%
Average 2014-23	1.3%	1.3%	1.3%
Average 2024-28	**1.5%***	**3.1%**	**0.8%**
Cumulative 2021-23	-17.3%	-17.3%	-17.3%
Cumulative 2024-28	**8.0%***	**16.4%**	**3.9%**

3. Data Sources, Methodology and Caveats

3.1 In order to form a forward view of the likely evolution of land values in Ireland our approach is based on identifying statistically significant relationships between changes in published indices of real estate capital values (commercial and residential) and various economic indicators. These are used to build econometric models to forecast future expected changes in the capital value indices. We also provide a qualitative commentary on how these may theoretically affect changes in land values.

Data Sources

3.2 To our knowledge there are no reliable time series for Irish agricultural or commercial land values. We therefore used capital value indices for commercial property (offices, retail, industrial and all property) and residential property for Dublin and Ireland.

3.3 The commercial property value indices used are annual data from MSCI Ireland covering the period 1985-2022 (an estimate has been provided for 2023 based on quarterly data). These indices are based on submitted valuations of institutionally held real estate that are standardised to analyse underlying movements in capital value across the market. Whilst not all the assets are "prime" quality, the samples do inherently reflect the better-quality properties typically held by such investors and as such are not necessarily reflective of "the market" as a whole – particularly as regards poorer quality properties and "non-core" locations.

3.4 Data is available both for Dublin and at the national level for office, industrial and retail sectors. All datasets were evaluated for use in providing forecasts of expected capital value changes for different sectors. It should be noted that the Morgan Stanley Capital Index (MSCI) Ireland is heavily skewed towards Dublin and the office sector. The annual dataset for 2021 had an index sample size of €11.6 billion, of which Dublin made up €10.8 billion – with Dublin offices alone accounting for 55% of the annual index sample.

3.5 On investigation, it was found that the Dublin and Irish indices were almost 100% correlated, largely reflecting the fact that most of the property in the MSCI sample is located in the Dublin area – although to some extent it may also be the case that conditions in other markets tend to mirror those in Dublin. As a result, any forecast of the Irish national indices would have yielded exactly the same result as forecasting the Dublin index – and thus we have provided only one forecast of the Dublin market for each of the commercial sectors.

3.6 Further details of the MSCI indices and methodology can be found in Annex I.

3.7 The residential property value index used in the report is the Residential Property Price Index (RPPI) produced by Ireland's Central Statistics Office (CSO) which covers the period 2005-2022 (an estimate has been provided for 2023 based on quarterly data). The RPPI is designed to measure the change in the average level of prices paid by households for residential properties sold in Ireland. The principal data source is stamp duty returns made to the Revenue Commissioners. We used the RPPIs for Dublin, and for Ireland excluding Dublin, to provide forecasts for respective capital value changes.

3.8 Further details of the RPPI indices and methodology can be found in Annex II.

3.9 Data and forecasts for the economic variables used to build the econometric models (referred to as "independent variables") were obtained from Oxford Economics, one of the world's leading

independent economic forecasting consultancies who are Avison Young's preferred provider for such data. The Oxford Economic forecasts have been updated in December 2023.

3.10 Oxford Economics now forecast the Irish economy to grow by an average of 3.3% p.a. over the next five years, which is close to the Consensus and the alternative scenario they had produced for us last year. We use therefore this updated economic scenario as our main/ baseline scenario and provide an upside and downside range as in the report last year

3.11 Details of the economic forecasts from Oxford Economics can be found in Section 4 and Annex III.

3.12 In this report we identify which of the forecast outcomes we consider to be our preferred forecast in relation to each sector. This is based on our assessment of the most likely movement in the capital value index concerned rather than any adherence to one or other of the above GDP-based scenarios.

Methodology

3.13 We conducted a visual inspection of the data, coupled with correlation analysis, to identify likely relationships between the capital value indices we are trying to forecast and those "independent" variables for which 5-year forecasts are available, which could therefore be used in the model.

3.14 Empirical analysis identified significant statistical relationships between changes in the capital value indices and their respective economic drivers. These were used to build regression models to forecast future changes in the indices over the forecast period 2024 to 2028 (2023 is an estimate based on quarterly data as annual data have not yet been released).

3.15 Variables examined as drivers of capital value growth included GDP and employment growth, foreign direct investment (FDI), population growth, consumer spending/retail sales, unemployment, and interest rates amongst others.

3.16 These variables were tested individually and in combination to assess their explanatory power and thus suitability for inclusion in the final set of models. We tested all possible combinations of variables that had displayed high correlation with capital values and/or made intuitive sense (for example we have tried including government bond yields alongside other variables, despite them having low direct correlation with capital values). Variables were also tested contemporaneously and using various positive or negative time lags.

3.17 Details of the variables selected for inclusion in the models are included below in the relevant sector sections.

3.18 The final models we have chosen are the ones that displayed the highest R-squared statistic: The R^2 displays the explanatory power of the variables to account for variation in capital values. For example, an R^2 of 0.7 means that the variables included in the analysis (regression) explain 70% of the historical variation in residential/ commercial price indices.

3.19 The primary output is forecasts of aggregate and 5-year average capital value growth for the indices examined for the period 2024-2028. While individual year forecasts are reported from the models' output, these should be treated with caution as over shorter term (1-2 year) periods, values are likely

to be influenced by local market supply-demand factors which will not be included in the model. Whilst such factors tend to "balance out" over a 5-year period as a whole (for example with initial undersupply and strong value growth being offset by supply entering the market and reduced value growth in subsequent years), they can have a material influence on the shorter-term timing of rates of growth within the forecast period.

3.20 To put the forecasts produced into context, we also provide "upside" and "downside" forecast ranges which were derived as follows:
Upside – assumes any growth in value is double the rate originally forecasted, and any decline in value is half the rate of the original forecasts, unless otherwise stated and explained.
Downside - assumes any growth in value is half the rate originally forecasted, and any decline in value is double the rate of the original forecasts, unless otherwise stated and explained.

Caveats and assumptions

3.21 The forecasts contained with this report are based solely on a statistical econometric modelling exercise designed to identify past relationships between the real estate market and the economy, which were then used to suggest potential future trends based on assumptions and forecasts about the performance of the Irish economy in future years.

3.22 The models take no direct account of current or future market conditions, which will be a critical determinant of future capital value performance. In the commentary accompanying the forecasts, we have made suggestions regarding likely capital value movements based on what knowledge we do have and our experience in real estate analysis in other markets. However, neither the forecasts nor the subjective views expressed in the report should be relied upon without first validating these with other sources who have sufficient market knowledge and experience to assess their accuracy.

3.23 Forecasting is an inherently uncertain activity, which is subject to unexpected changes in the macro-economic and geo-political environment. Events that are unknown at the time of the forecast exercise, undertaken in December 2023 and early January 2024, or were viewed as low risk at the time but subsequently escalated, could significantly impact the forecast outcome.

3.24 The forecast relies upon data and forecasts of independent variables that have been obtained from sources which we deem reliable and, while thought to be correct, are not guaranteed by Avison Young. The forecasts included do not guarantee future performance and are provided only as at the date of issue.

3.25 Our forecasts are based on our own assumptions, which may change in the light of subsequent events and data post-publication of this report.

3.26 Our empirical research has identified historic statistical relationships between dependent and independent variables, which we have used as the basis of regression models. These statistical

relationships could change in future years from those which have been identified in the historic data. Econometric forecasting is inherently based on the assumption that historic relationships – in this case between real estate capital values and underlying economic drivers - hold true into the future. In some cases, this is clearly open to question.

3.27 For example, in the office sector, the relationship between employment growth and demand for office space is changing due to recent increases in flexible working, which may or not prove to be permanent. Demand for retail space may no longer be linked to retail sales in the way it was previously due to the growth in online shopping, which also has implications for the industrial sector.

3.28 Where we believe appropriate, we have commented on the potential impact of these changes on the forecast results. The uncertainty around the potential impact of these and other changes should be considered when determining how much reliance to replace on the forecasts and opinions set out in this report.

3.29 Identifying valid historic statistical relationships between variables is dependent on having a sufficiently robust time series of relevant data across multiple market cycles. It should be noted that the residential property price indices on which the residential forecasts have been produced only start in 2005. The period covered by the data is therefore relatively short and furthermore has been characterised by several periods of highly unusual conditions (including the Financial Crisis of 2007-9, the subsequent Irish economic crisis of 2010-13, the exceptional monetary policy which followed, and the Covid-19 pandemic). These limitations should be considered when assessing the validity of the forecasts produced for the residential market in Ireland.

3.30 The accuracy of the forecast outcomes will be in part dependent on whether Oxford Economics' forecast of the independent variables is realised. Any variation between the OE forecast and the actual performance of the independent variables is likely to impact on the accuracy of the capital value forecasts contained in this report – potentially very significantly. Neither Avison Young nor Oxford Economics make any warranty about the accuracy of the underlying economic forecasts used in this report.

3.31 The upside/downside ranges around the capital value forecasts are intended to provide an indication of what we believe to be the most likely range of capital value change outcomes where the forecast varies for reasons within the bounds of normal upside or downside possibilities. These scenarios would not extend to a major market failure (like a financial crisis or a 'Black Swan' event) on the downside, or a period of irrational exuberance on the upside.

3.32 We would reiterate that the forecasts provided are our view of the likely change in the capital value indices contained within the report, subject to any assumptions set out therein. The forecasts do not represent any form of valuation advice and should not be relied upon as such. We make no warranty about their applicability to future value changes of any individual or group of properties.

3.33 The forecasts in this report are not guarantees of future performance and undue reliance should not be placed on them. The forecasts necessarily involve known and unknown risks and uncertainties, which may cause actual performance and financial results in future periods to differ materially from any projections of future performance or result expressed or implied by the forecasts.

3.34 Although the forecasts contained in this report are based upon what Avison Young believes are reasonable assumptions, there can be no assurance that the forecasts will prove to be accurate, as actual results and future events could differ materially from those anticipated in the forecasts.

4. Economic Forecast Scenario

4.1 Full details of the baseline scenario of Oxford Economics that was used to prepare the forecasts are provided in Annex III. This scenario is summarised below.

4.2 It has been widely acknowledged the official GDP figures of the Republic of Ireland are distorted by the impact of 'base erosion and profit shifting' tax strategies of large multi-national corporations. Oxford Economics do exclude the effect of international profit movement through Ireland from their GDP forecast, focusing instead on the typical components of national output.

4.3 Oxford Economics forecast real GDP growth averaging 3.3% p.a. over the forecast period of 2024 to 2028 versus a historical 10-year average of around 9% (over 2013-2022). The comparatively low projection can partly be accounted for by the removal of the international profit movement effect. The main arguments, though, are that global trade is projected to be lower and that the Irish economy has reached a degree of optimum performance with limited spare capacity, making it difficult to see how very high levels of GDP growth achieved in the past can now be sustained. Ireland has the highest GDP per hour worked in the OECD, the 3rd highest GDP per capita PPP in the world (excluding microstates) and an unemployment rate of just 4.8% (November 2023).

4.4 Overall, Oxford's outlook for GDP appears now more in line with the alternative GDP scenario we had asked them to prepare for us last year and the consensus view produced by other forecasters. We now use Oxford's scenario as our baseline/ main scenario and we do not run an alternative one.

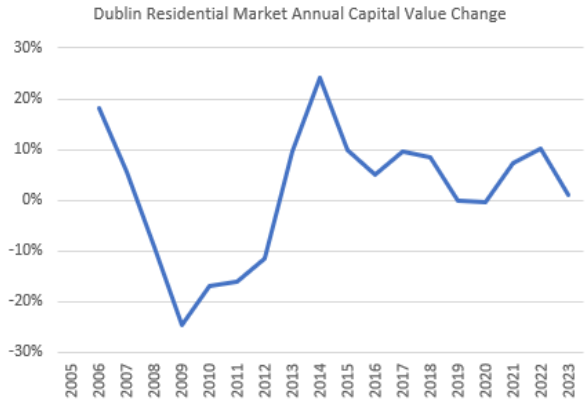
4.5 Oxford is expecting the Irish economy to have contracted in 2023. This reflects the sharp rises in interest rates from the ECB filtering through as higher debt costs for consumers, businesses and the public sector, as well as the impact of the marked slowdown in the global economy and external demand.

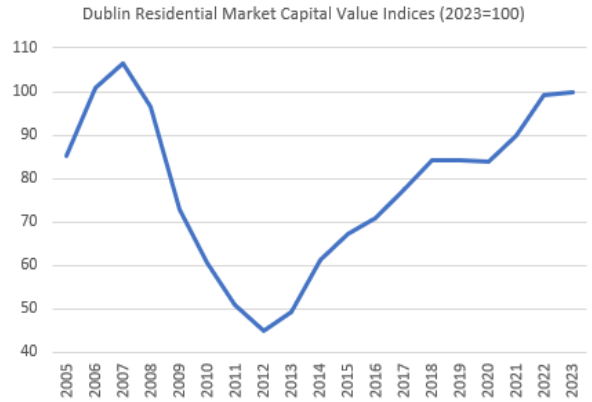
4.6 Irish GDP growth is then expected to rebound over the forecast period 2024 to 2028. Employment growth is expected to be healthy but lower to the historical trend, consistent with more moderate GDP growth and unemployment to increase slightly partly driven by fast labour force growth

5. Dublin Residential Market

5.1 The historic performance of Dublin residential capital values as indicated by the Residential Property Price Index is shown in the charts below.

Dublin residential historical capital value change*





*2023 is an estimate

5.2 Values have trended strongly upwards over the last ten years, except for a modest decline in 2020 due to the Covid-19 pandemic. Prices are expected to have started stabilising in 2023 (2023 is an estimate from quarterly data) due to affordability issues and weaker demand. Tight supply, though, underpins value growth.

5.3 The robust historical trend growth is due to the strong performance of the Irish and Dublin economies, coupled with an underlying structural shortage of housing in Dublin relative to demand.

5.4 We examined a range of potential variables that correlated with the observed movements in the capital value index. The variables selected for inclusion in the final model are as follows.

5.5 **Dublin working age population growth in the following year, t+1 (correlation coefficient 0.90):** Working age population is an intuitive driver of demand for housing. Statistically the variable works best in the model using the growth in the following year to explain movements in the current year.

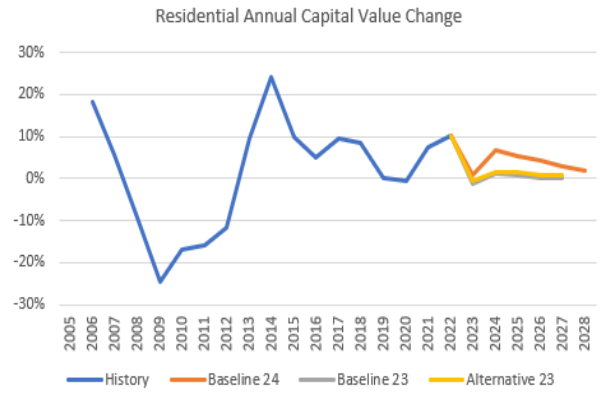
5.6 **National employment growth (correlation coefficient 0.83):**
National employment growth is an intuitive driver of house prices given that it reflects effective demand (ie with an ability to pay) for housing.

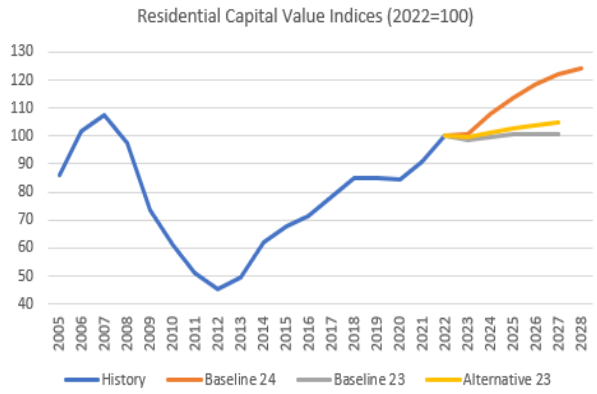
5.7 These variables together with their associated forecasts from Oxford Economics were then incorporated into an econometric model and used to generate forecasts for the Dublin residential capital value index. Details of the data series and model outputs are provided in the relevant

Annex. The forecast equation has an R^2 of 0.84 suggesting that it has good explanatory power in explaining the historic movements in capital values and thus should be a useful indicator of future movements in capital values, subject to the qualifications and caveats set out in Section 3 above.

5.8 Graphs comparing the Baseline scenario 2024 update with the 2023 Baseline and Alternative scenarios, and tabular summaries of the 2024 forecasts including the Upside and Downside range are shown below, with full model details provided in Annex IV.

Dublin residential 2023 forecasts vs 2024 update





Dublin Residential 2024 forecast update

Dublin Residential	Baseline scenario	Upside	Downside
2023	0.9%	0.9%	0.9%
2024	6.8%	10.2%*	3.4%
2025	5.5%	8.3%*	2.8%
2026	4.3%	6.4%*	2.1%
2027	3.0%	4.4%*	1.5%
2028	1.8%	2.7%*	0.9%
Average 2014-23	7.5%	7.5%	7.5%
Average 2024-28	**4.3%**	**6.4%***	**2.1%**
Cumulative 2021-23	19.5%	19.5%	19.5%
Cumulative 2024-28	**23.1%**	**36.1%***	**11.1%**

5.9 Under the Baseline scenario Dublin house prices are projected to rebound this year as the ECB starts cutting rates, credit conditions ease and Irish economic growth resumes.

5.10 The model suggests average growth of around 4.3% p.a. over 2024 to 2028. This compares with 7.5% trend growth over the last ten years. It does appear realistic that house prices grow at below the recent average rate as economic and employment growth projections are lower over the forecast period than in recent years, and affordability is likely to become increasingly stretched.

5.11 Avison Young believes that the Baseline scenario projections for ongoing robust, albeit lower, growth look plausible, given that Dublin is widely regarded as suffering from an undersupply of housing that is unlikely to be resolved over the next 5 years

5.12 However, our upside view (derived using our standard Upside methodology, see Section 3.20), gives an Upside scenario of 8.5% pa growth over the next 5 years, and cumulative growth of 50.1% in total over the forecast period.

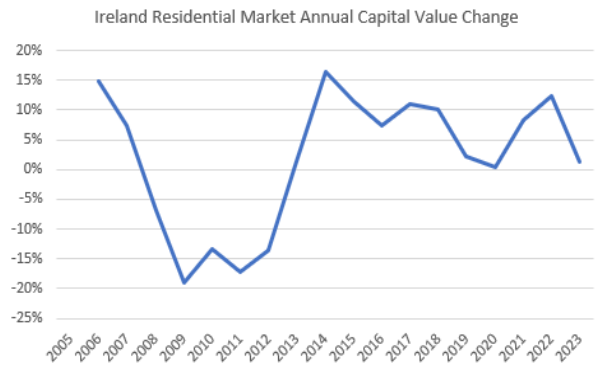
5.13 While there have been 5-year historical periods that have seen similar sharp house price rises, we don't find this Upside scenario plausible as affordability under this scenario will become extremely stretched and result in a cooling of the housing market

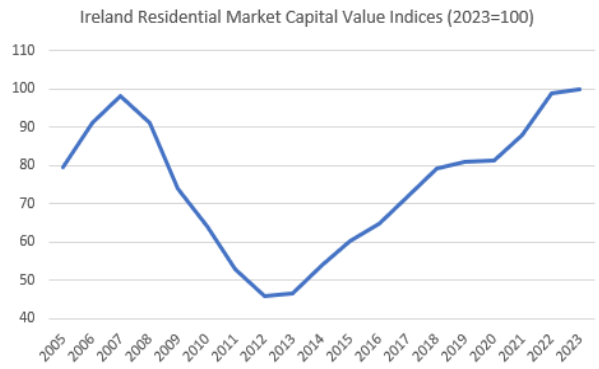
5.14 We have therefore produced an adjusted Upside which gives 6.4% pa growth over the next five years and cumulative growth of 36.1% in total over the forecast period (assuming any growth in value is 1.5 times the rate originally forecasted under the Baseline scenario).

6. Ireland Residential Market

6.1 The historic performance of Irish residential capital values as indicated by the Residential Property Price Index is shown in the charts below.

Ireland residential historical capital value change*





*2023 is an estimate

6.2 Values have shown a strong upward growth trend over the last ten years, even showing very modest growth during 2020 at the peak of the Covid-19 pandemic and in 2023 (estimated)

6.3 We examined a range of potential variables that correlated with the observed movements in the capital value index. The variables selected for inclusion in the final model are as follows.

6.4 **Residential price growth in the previous year, t-1 (correlation coefficient 0.73):**
Housing markets tend to have strong momentum, given that domestic buyers are not always technically analytical or "economically rational" in their behaviour, and can be strongly influenced by media coverage (particularly in a rising market). Rising prices encourage potential buyers into the market in the expectation of future house price growth and/or to "get into the market before prices rise further". Falling prices can have the opposite effect. Value change the previous year is therefore a good predictor of growth or decline in the current year.

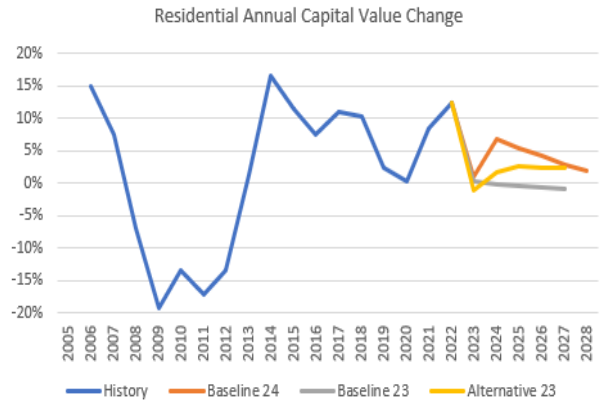
6.5 **National employment growth (correlation coefficient 0.84):**
National employment growth is an intuitive driver of house prices given that it reflects effective demand (ie with an ability to pay) for housing.

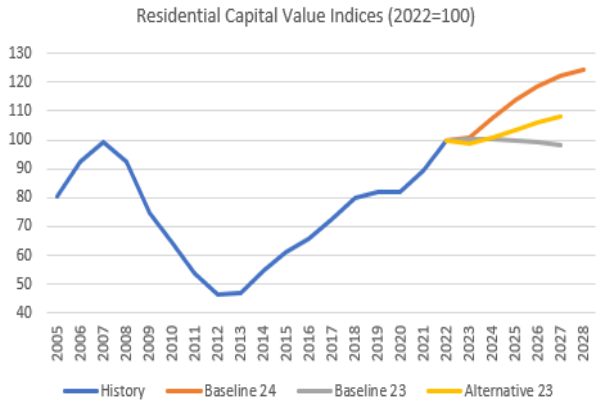
6.6 These variables together with their associated forecasts from Oxford Economics were then incorporated into an econometric model and used to generate forecasts for the Irish residential capital value index. Details of the data series and model outputs are provided in the relevant Annex. The forecast equation has an R^2 of 0.76 suggesting that it has reasonable explanatory

power in explaining the historic movements in capital values and thus should be a useful indicator of future movements in capital values, subject to the qualifications and caveats set out in Section 3 above.

6.7 Graphs comparing the Baseline scenario 2024 update with the 2023 Baseline and Alternative scenarios, and tabular summaries of the 2024 forecasts including the Upside and Downside range are shown below, with full model details provided in Annex V.

Ireland Residential 2023 forecasts vs 2024 update





Ireland Residential 2024 forecast update

Irish Residential	Baseline scenario	Upside	Downside
2023	1.2%	1.2%	1.2%
2024	4.4%*	6.5%*	2.2%
2025	4.2%*	6.3%*	2.1%
2026	3.6%*	5.5%*	1.8%
2027	3.0%*	4.5%*	1.5%
2028	1.3%	1.9%*	0.6%
Average 2014-23	8.1%	8.1%	8.1%
Average 2024-28	3.3%*	4.9%*	1.6%
Cumulative 2021-23	23.1%	23.1%	23.1%
Cumulative 2024-28	17.5%*	27.1%*	8.5%

*Denotes model output was adjusted as explained below

6.8 The model developed using the Baseline economic scenario actually forecasts quite more modest national house price growth than the house price forecasts for Dublin suggest.

6.9 This difference appears to be very unlikely, given the positive outlook for the Irish economy and positive spillover effects from Dublin capital values appreciation. Moreover, historically the Dublin and Irish house price indices have been very closely correlated (correlation of 0.96 between the two series over 2006-2023).

6.10 We have therefore adjusted the Irish Baseline scenario forecasts for 2024 to 2027 by assuming double the rate for these years.

6.11 Under the Adjusted Baseline scenario Irish house prices are projected to grow by 3.3% p.a. over 2024 to 2028, which compares with 8.1% trend growth over the last ten years

6.12 The Adjusted Baseline forecasts for Ireland appear more plausible and in line with the Dublin forecasts

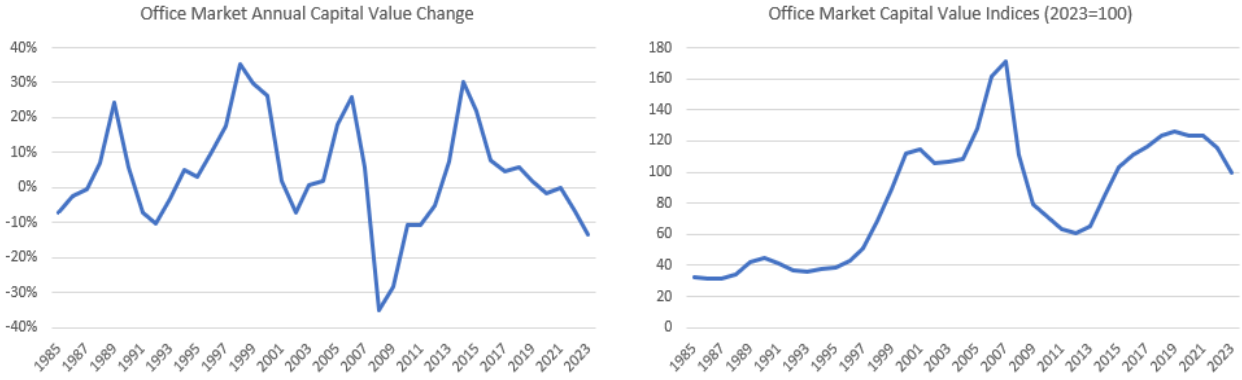
6.13 We have further adjusted the Upside view, as in the case of Dublin, assuming 1.5 times the growth of the adjusted baseline forecasts

6.14 The adjusted Upside gives 4.9% pa growth over the next five years and cumulative growth of 27.1% in total over the forecast period

7. Dublin Office Market

7.1 The historic performance of Dublin office capital values as indicated by the MSCI Index is shown in the charts below.

Dublin office market historic capital value change*



*2023 is an estimate

7.2 It is immediately apparent that values have been extremely volatile, with four periods of very strong growth (20%+ per annum) and five periods of material declines in values (-5% to -10%, and a fall of over 60% following the Financial Crisis). The potential for the market to show such significant growth or decline over relatively short periods should be considered when assessing the forecasts below.

7.3 We examined a range of potential variables that correlated with the observed movements in the capital value index, although none displayed a coefficient above 0.72. The variables selected for inclusion in the final model are as follows.

7.4 **National employment growth in the following year, t+1 (correlation coefficient 0.70):** National employment growth is an intuitive driver of occupier demand for office space. Companies make decisions regarding future space requirements in anticipation of future hiring decisions, which impacts rental growth in the current year. Investors are also forward looking and adjust bid-offer prices in anticipation of future demand and rental levels.

7.5 **Change in national unemployment rate (correlation coefficient -0.71):** Change in unemployment is also an indicator of changing labour market conditions and hiring activity, and thus of occupier and investor demand for office space.

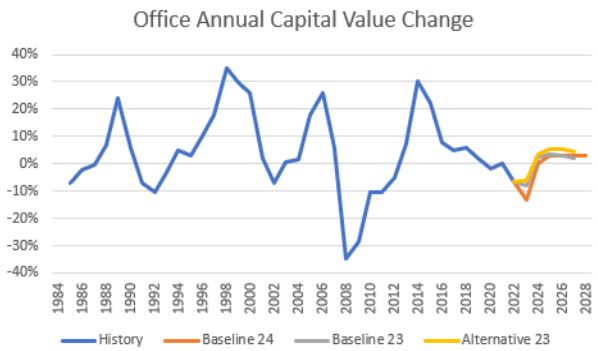
7.6 **Change in Irish 10-year government bonds in the previous year, t-1 (correlation coeff -0.46):** Investors assess the pricing of most asset classes, including real estate, on a risk-adjusted basis against the "risk free rate of return", the best proxy for which is the relevant 10-yr government bond yield. International analysis conducted previously by Avison Young shows that movements in bond yields feed through into real estate yields with a typical lag of 9-15 months depending on the country and market conditions. Thus falling (or rising) bond yields drive subsequent declines (or increases) in property yields which puts upward (or downward) pressure on capital values – hence the negative

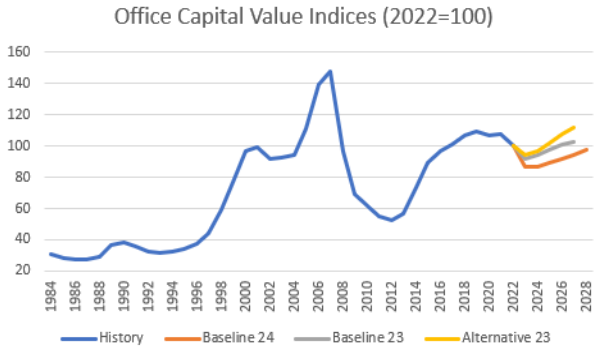
correlation. The direct correlation between bps movements in bond yields and capital values is only -0.46, which is not particularly strong, but including them in the multivariable regression equation does help increase its explanatory power and seems intuitively logical.

7.7 These variables together with their associated forecasts from Oxford Economics were then incorporated into an econometric model and used to generate forecasts for the Irish residential capital value index. Details of the data series and model outputs are provided in the relevant Annex. The forecast equation has an R^2 of 0.72 suggesting that it has reasonable explanatory power in explaining the historic movements in capital values and thus should be a useful indicator of future movements in capital values, subject to the qualifications and caveats set out in Section 3 above.

7.8 Graphs comparing the Baseline scenario 2024 update with the 2023 Baseline and Alternative scenarios, and tabular summaries of the 2024 forecasts including the Upside and Downside range are shown below, with full model details provided in Annex VI.

Dublin office 2023 forecasts vs 2024 update





7.9 Office capital values are estimated to have further declined by more than 10% last year (Avison Young estimates based on quarterly data, and Oxford Economics projections)

7.10 The sharp decline in office values can be partly attributed to rapidly rising interest rates and tighter credit conditions adversely affecting liquidity and pricing. Moreover, we have witnessed a structural change in office demand due to the post-pandemic rise in flexible working, an increased emphasis on environmental sustainability issues as well as on prime locations and building specifications in order to attract and retain talent.

7.11 These structural shifts cannot yet be captured in models based on the historical relationship between employment patterns and office values and as a result the model output may have to be adjusted to reflect their impact.

Dublin Offices 2024 forecast update

Dublin Offices	Baseline scenario	Upside	Downside
2023	-13.3%	-13.3%	-13.3%
2024	0.2%	0.4%	0.1%
2025	3.1%	6.1%	1.5%
2026	2.8%	5.6%	1.4%
2027	2.8%	5.6%	1.4%
2028	2.9%	5.9%	1.5%
Average 2014-23	5.1%	5.1%	5.1%
Average 2024-28	**2.4%**	**4.7%**	**1.2%**
Cumulative 2021-23	-19.2%	-19.2	-19.2
Cumulative 2024-28	**12.4%**	**25.9%**	**6.0%**

7.12 Under the Baseline economic scenario office capital values are projected to stabilise in 2024 before returning to positive growth of 3.1% in 2025. Overall, the model forecasts average growth of 2.4% pa and cumulative growth of 12.4% over 2024 to 2028.

7.13 We think this positive outlook for capital value growth is realistic as a central scenario, given the sharp declines of capital values over the last two years. It is at the same time a conservative scenario as capital values are not projected to return to their 2021 levels by the end of the forecast period.

7.14 We have also included Upside and Downside ranges calculated according to our standard methodology (see Section 3.21). These two ranges are very pertinent in view of the increasing bifurcation in pricing between prime and secondary office assets.

7.15 The Upside suggests average growth of around 4.7% pa over 2024 to 2028 and cumulative growth of close to 26% over the same period. These projections are highly unlikely and would apply to only a small part of the office market, i.e. prime assets in very core areas.

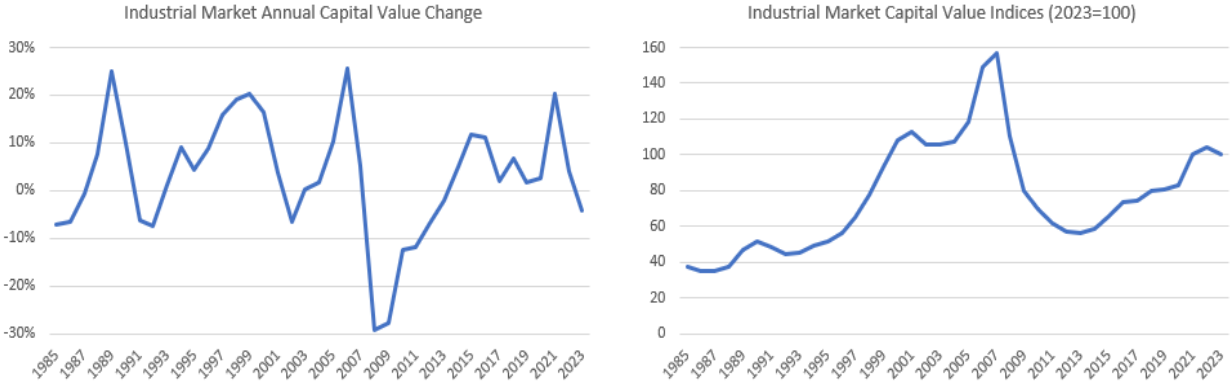
7.16 The Downside gives average growth of around 1.2% pa and cumulative growth of 6% over the forecast period.

7.17 We believe this to be an entirely plausible scenario, particularly outside the core areas of the Dublin office market. Given current trends in office demand, occupiers are focused on securing top quality, environmentally sustainable buildings in good locations. There is a likelihood that government legislation regarding energy efficiency ratings coupled with occupier and investor preferences will require owners of secondary (or worse) buildings to invest heavily in upgrading them. This will weigh heavily on values. The trajectory is difficult to predict but it seems likely that values – especially at the secondary/tertiary end of the market – could well fall outside the range of our Downside as presented above.

8. Dublin Industrial Market

8.1 The historic performance of Dublin industrial capital values as indicated by the MSCI Index is shown in the charts below.

Dublin industrial historic capital value change*



*2023 is an estimate

8.2 As has been seen in many other countries, values have shown a strong upward growth trend over the last ten years, and indeed over the last thirty years, as the sector has experienced a "re-rating" by investors. This has been particularly strong in Ireland which has benefitted from significant inward investment with the country viewed as an attractive manufacturing location situated within the European Union. Values have increased by almost 200% since the late 1980s, and by 85% in the decade since 2013.

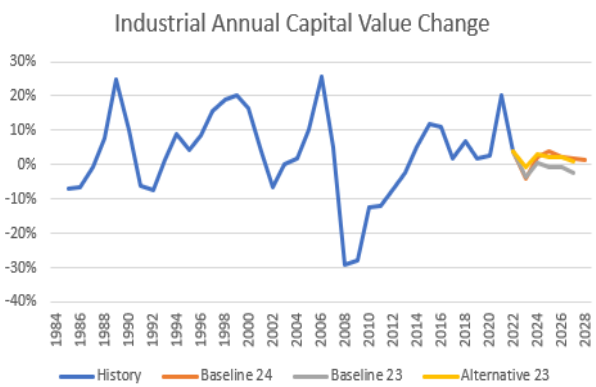
8.3 We examined a range of potential variables that correlated with the observed movements in the capital value index. The variables selected for inclusion in the final model are as follows.

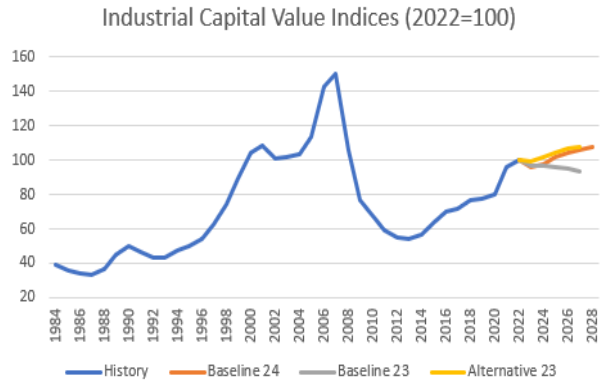
8.4 **Retail sales volume growth (correlation coefficient 0.83):**
In recent years the industrial market has increasingly been driven by demand for logistics/warehousing space rather than traditional industrial production. The rapid growth of online shopping, coupled with expansion of third-party logistics providers supporting retail and production activity, means that retail sales volumes are intuitively a strong driver of occupier and investor demand and for industrial property and land.

8.5 **National manufacturing employment growth in the following year, t+1 (correlation coefficient 0.60):**
Manufacturing employment growth is an intuitive driver of both direct demand for industrial/warehousing space, and also of expected economic growth and consumer/business demand for goods and warehousing. Companies make decisions regarding future space requirements in anticipation of future levels of activity. Investors are also forward looking and adjust bid-offer prices in anticipation of future demand and rental levels.

8.6 These variables together with their associated forecasts from Oxford Economics were then incorporated into an econometric model and used to generate forecasts for the Irish industrial capital value index. Details of the data series and model outputs are provided in the relevant Annex. The forecast equation has an R^2 of 0.84 suggesting that it has very good explanatory power in explaining the historic movements in capital values and thus should be a good indicator of future movements in capital values, subject to the qualifications and caveats set out in Section 3 above.

Dublin industrial 2023 forecasts vs 2024 update





Dublin Industrial 2024 forecast update

Dublin Industrial	Baseline scenario	Upside	Downside
2023	-4.1%	-4.1%	-4.1%
2024	2.1%*	4.2%	1.0%
2025	3.8%*	7.7%	1.9%
2026	2.3%*	4.6%	1.2%
2027	1.9%*	3.8%	1.0%
2028	1.5%*	2.9%	0.7%
Average 2014-23	6.1%	6.1%	6.1%
Average 2024-28	**2.3%***	**4.6%**	**1.2%**
Cumulative 2021-23	20.1%	20.1	20.1
Cumulative 2024-28	**12.2%***	**25.4%**	**5.9%**

*Denotes model output was adjusted as explained below

8.7 Graphs comparing the Baseline scenario 2024 update with the 2023 Baseline and Alternative scenarios, and tabular summaries of the 2024 forecasts including the Upside and Downside range are presented above, with full model details provided in Annex VII.

8.8 Industrial was the only commercial real estate sector to register positive capital value growth in 2022. Industrial capital values are projected to have declined by around 4% last year (estimations based on quarterly data), though they are expected to have fallen less than in the other commercial real estate sectors.

8.9 The model developed using the Baseline economic forecast predicts a modest recovery (1.6% average pa) over the next two years before values stagnate and decline for the remainder of the forecast period. This is primarily driven by a slowdown in retail sales growth compared to previous years.

8.10 This trajectory appears relatively unlikely for two reasons. First, we would expect higher retail sales growth as real disposable incomes keep growing due to solid employment growth and consumers still have most of their excess savings accumulated during the pandemic to spend. We therefore produce an adjusted Baseline scenario by adjusting upwards the five-year retail sales growth projections to an average of 2.9% pa vs 2.3% pa in the Baseline scenario and 3.8% pa over the last ten years. We find this scenario more realistic and aligned with the GDP and employment growth forecasts.

8.11 Second, the logistics/warehousing component (and to some extent the manufacturing component) of the industrial market is experiencing significant levels of occupier demand growth due to structural changes which are still working their way through the economy and the property market. These changes include a restructuring of supply chains in response to global geopolitical and other pressures, as well as economic pressures (rising demand from ecommerce, localisation of production to reduce carbon footprints and rising production costs in Asian emerging markets).These pressures are likely to continue to push up occupier and thus investor demand for industrial assets in the short to medium- term at least.

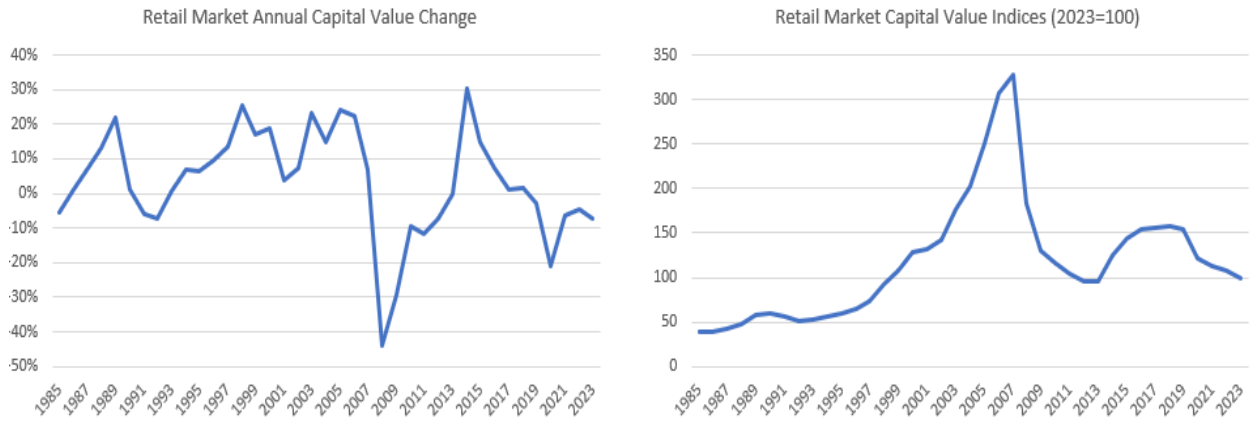
8.12 Under the adjusted Baseline economic scenario industrial capital values are projected to recover in 2024 and to grow by an average of 3.3% p.a. over the next five years. These forecasts are highly plausible and still look conservative when compared to 6.1% pa trend growth over the last ten years.

8.13 We have also included Upside and Downside ranges calculated according to our standard methodology (see Section 3.20). We believe Dublin industrial capital value growth as measured by the index is likely to be somewhere close to the adjusted Baseline scenario range with the risks to our outlook broadly balanced in case of weaker or stronger demand

9. Dublin Retail Market

9.1 The historic performance of Irish retail capital values as indicated by the MSCI Index is shown in the charts below.

Dublin retail historic capital value change*



*2023 is an estimate

9.2 Values saw a very deep correction during the Global Financial Crisis period. While a partial recovery occurred in 2014-2018, this was mostly reversed in a second correction that began in 2019, so pre-dating the Covid-19 pandemic. Overall, the Dublin retail market has shown significant resilience in comparison to the bigger impacts on retail values seen in many countries, where increased ecommerce competition has pushed retail capital values down sharply.

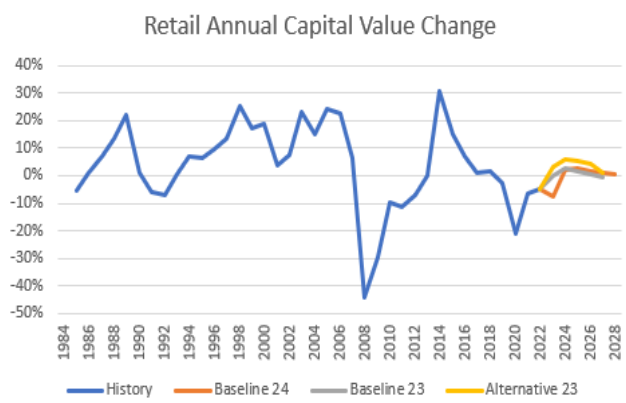
9.3 We examined a range of potential variables that correlated with the observed movements in the capital value index. The variables selected for inclusion in the final model are as follows.

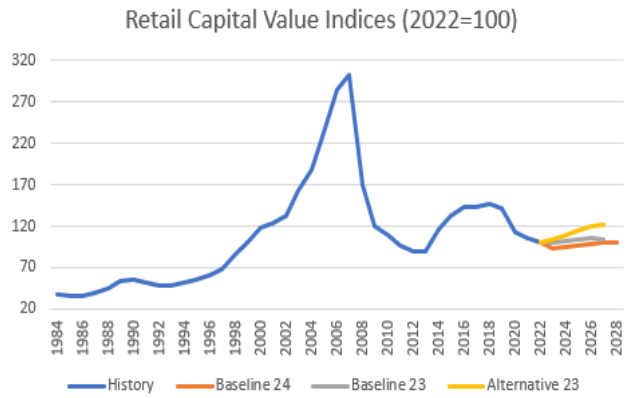
9.4 **Retail sales volume growth (correlation coefficient 0.68):**
This is intuitively likely to be a driver of retail values as the volume of spending in shops as reported in recent official data will be a major influence on how investors view retail property assets. These figures will probably be closely examined during the market research stage of a retail investment transaction, and shape the decision whether to acquire or dispose of retail property investments and if so, at what price.

9.5 **Retail sales volume % growth, t+1 (correlation coefficient 0.67):**
As well as the current performance of retail sales, forward-looking investors will consider future expectations for retail spending, taking into account anticipated events that could further buoy or dampen spending power. Retail sales actually achieved in the following year are likely to be a good indicator of sentiment regarding the future trajectory of the retail sector in the current year.

9.6 These variables together with their associated forecasts from Oxford Economics were then incorporated into an econometric model and used to generate forecasts for the Irish retail capital value index. Details of the data series and model outputs are provided in the relevant Annex. The forecast equation has an R^2 of 0.63 suggesting that it has reasonable explanatory power in explaining the historic movements in capital values and thus should be a useful indicator of future movements in capital values, subject to the qualifications and caveats set out in Section 3 above.

Dublin retail 2023 forecasts vs 2024 update





Dublin Retail 2024 forecast update

Dublin Retail	Baseline scenario	Upside	Downside
2023	-7.3%	-7.3%	-7.3%
2024	2.2%*	4.4%	1.1%
2025	2.8%*	5.6%	1.4%
2026	1.5%*	2.9%	0.7%
2027	0.9%*	1.8%	0.5%
2028	0.4%*	0.8%	0.2%
Average 2014-23	1.3%	1.3%	1.3%
Average 2024-28	**1.5%***	**3.1%**	**0.8%**
Cumulative 2021-23	-17.3%	-17.3%	-17.3%
Cumulative 2024-28	**8.0%***	**16.4%**	**3.9%**

*Denotes model output was adjusted as explained below

9.7 Graphs comparing the Baseline scenario 2024 update with the 2023 Baseline and Alternative scenarios, and tabular summaries of the 2024 forecasts including the Upside and Downside range are shown above, with full model details provided in Annex VIII.

9.8 Retail capital values are estimated to have continued falling in 2023 for the fifth consecutive year

9.9 Under the Baseline economic scenario, we forecast very low growth (0.2% average pa) over the next two years before values start declining again for the remainder of the forecast period. This is entirely driven by a slowdown in retail sales growth compared to previous years.

9.10 The above scenario is highly unlikely for two reasons. First, we believe stronger retail sales growth is more in line with the GDP and employment projections of the Baseline economic scenario (see Section 8.12)

9.11 Second, after a significant repricing in the retail market with values declining for five consecutive years, we would expect a stabilization and recovery in values, especially as domestic demand is expected to be healthy

9.12 We therefore produce an adjusted Baseline scenario with the same retail sales growth assumptions used in the industrial model (by adjusting upwards the five-year retail sales growth projections to an average of 2.9% pa vs 2.3% pa in the Baseline scenario and an average of 3.8% pa trend growth over the last ten years).

9.13 Under this scenario we forecast a rebound in retail capital values over the next two years and growth moderating for the remainder of the forecast period. Overall, capital values are expected to grow by 1.5% pa over the next five years, which we believe is a reasonable projection

9.14 The Upside gives average growth of around 3.1% pa over 2024 to 2028 and the Downside suggests growth of around 0.8% pa over the same period. The upside range seems very optimistic. We therefore prefer to base our views around the output from the Adjusted Baseline economic scenario, but with the risks lying more towards the downside, given the structural challenges facing the retail market

10. Capital Values vs Land Values

10.1 The underlying value of the land is an integral part of a real estate asset's capital value, which is why we feel capital value indices are a good proxy for forecasting potential land value changes. Nevertheless, land is not all of what is contained in the capital value, and there will be a degree of variation between the change in the land value and the price movement of the overall building.

10.2 The value of land with planning permission for commercial or residential development can in simplistic terms be characterised in a very basic residual calculation model which consists of: ***Land value = completed building value – (construction cost + finance cost + desired return on equity)*** (noting that any demolition or other site preparation costs should be included within "construction")

10.3 Therefore, the movement of any of the main components can have a positive or negative impact on the residual value of the land. For instance, in a bear market finished building values may be falling and required return on equity rising (as the investor seeks greater compensation for the risk of buying in a difficult time), thus squeezing the land value. Conversely, in a bullish market, developers will bid up the value of the land in anticipation of future capital value increases.

10.4 It should be noted that values of land or development sites transacted in the market are therefore highly dependent on the forward view (and risk appetite) of developer-investors, including their expectations for construction and finance costs as well as building capital values.

10.5 Our overall outlook is for capital values in the markets we are forecasting to moderately increase in 2024, and then exhibit some degree of recovery over the full forecast period – depending on the sector and forecast scenario. Essentially, we are predicting a period of moderate growth for the overall property sector.

10.6 Land values are expected to broadly track capital values but are also likely to be affected by construction costs, for two reasons.

10.7 Firstly, in 2021 and 2022, construction costs rebounded sharply as the global economy restarted from Covid lockdown, placing strains on supply chains. The well document geopolitical instability increased the upwards pressure. The SCSI's tender price index rose by 2.2% in 2020, then increased by 13.4% in 2021 and 11.5% in 2022. This will have squeezed the growth margin for land values.

10.8 Second, with rising regulatory and market pressures on developers to build or retrofit buildings to meet higher ESG standards, there is good reason to suppose there will be further upwards pressure on construction costs in the coming years.

10.9 Finally, all these factors are shaped by the property market and economic cycle. In boom times, irrational exuberance can buoy overall capital values creating upside for land values. However, we are in a time of slowdown for both the property market and the economy, which will likely squeeze the share of capital growth that goes to land values.

10.10 Given the above, we believe that while land values will broadly track capital values over the forecast period, there will probably be a moderate degree of underperformance.

10.11 Note that the above comments only apply to land that is (or may in future be) zoned for development. Agricultural land values are subject to a completely different of factors which we are not able to comment on and may therefore exhibit very different patterns of value change.

ANNEX I

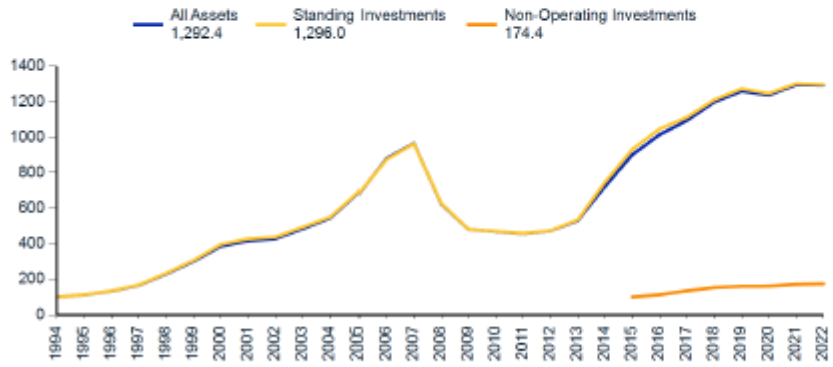
MSCI Indices

MSCI/SCSI Ireland Annual Property Index (Unfrozen) (EUR)

This index measures unlevered total returns of directly held property investments from one valuation to the next. The index tracks performance of 424 property investments, with a total capital value of EUR 10.5 billion as at December 2022.

Annual Index Performance

PROPERTY RETURNS (EUR) (DEC 1994 - DEC 2022)



Calendar Year Performance (%)

Year	All Assets[1]	Standing Investments[2]	Non-Operating Investments[3]
2022	-0.2	-0.4	1.7
2021	4.6	4.4	6.2
2020	-1.7	-2.0	0.5
2019	5.1	5.1	4.7
2018	9.5	8.9	13.8
2017	7.9	6.3	19.3
2016	12.5	12.2	13.0
2015	24.8	24.8	-
2014	36.1	39.7	-
2013	12.3	13.0	-

Index Performance

PROPERTY RETURNS (%) DEC 2022

					ANNUALIZED TOTAL RETURN					
	1 Qtr	6 Mo	YTD	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	Since Inception
All Assets[1]	-	-	-0.2	-0.2	2.2	0.9	3.4	5.3	10.6	9.6
Standing Investments[2]	-	-	-0.4	-0.4	2.0	0.6	3.1	4.8	10.6	9.6
Non-Operating Investments[3]	-	-	1.7	1.7	3.9	2.8	5.3	8.3	-	-

Index Risk Characteristics

(%) DEC 1994 - DEC 2022

	ANNUAL					ANNUALIZED TOTAL RETURN				
	3 Yr	5 Yr	7 Yr	10 Yr	Since Inception	3 Yr	5 Yr	7 Yr	10 Yr	Since Inception
Standard Deviation	-	-	-	-	-	-	-	5.1	11.6	16.0
Semi Deviation[4]	-	-	-	-	-	-	-	-	2.9	11.2

[4]Below-target semi deviation

Capital Invested

TOTAL TO DEC 2022 % OF BEGINNING PERIOD CV

	CUMULATIVE									
	1 Qtr	6 Mo	YTD	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	Since Inception
Purchases[5]	-	-	0.1	0.1	2.5	5.4	25.0	41.3	88.5	198.3
Sales[6]	-	-	2.0	2.0	7.1	8.7	15.4	22.3	31.8	107.4

[5]Includes part purchases, [6]Includes part sales

Index Characteristics

Market Value (EUR m)	10,455
Number of Portfolios	21
Number of Properties	424
Average Property Value (EUR m)	24.7
Value Appraised %	99

Market Characteristics

Estimated Market Size (EUR m)	27,738
As of Date	Dec-2022

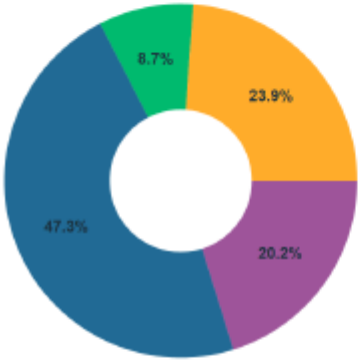
PERCENTILE DISTRIBUTION OF PROPERTY VALUES (EUR m)

95th%	118.94
75th%	24.99
50th%	9.22
25th%	4.08
5th%	1.25

Index Transparency

	Total Market Value (EUR m)	Average Property Value (EUR m)	Number Of Portfolios	Number Of Properties	Top 5 Properties
Retail	2,110	13.9	13	152	45.2%
Office	4,942	36.6	14	135	17.6%
Industrial	908	11.9	9	76	-
Other	445	12.0	5	37	40.4%

Property Sector Weights



Sector weights are calculated by aggregating the capital value of individual assets across the main property types. This illustrates the composition of the index and whether there is a heavier concentration in a particular property sector thus having a greater impact on the overall index performance. Where applicable, MSCI's client confidentiality and dominance rules suppress data based on small or skewed samples. Therefore the impacted sectors may not be reported individually but included in "Others".

IN ASSOCIATION WITH

SCSI Chartered property, land and construction surveyors

INDEX SPONSORS

Lisney

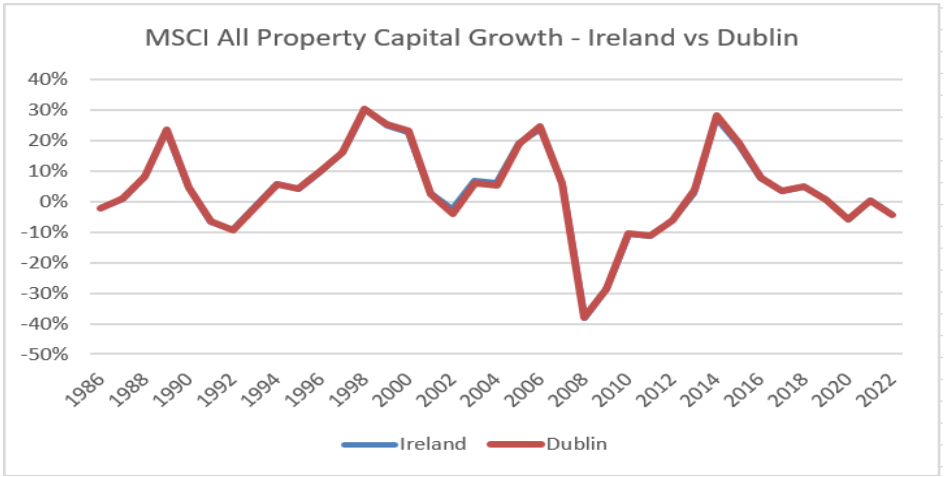
Index Methodology

[1]All Asset performance measures every direct property investment in MSCI's index database comprised of all property sectors, ownership structures and interests.
[2]The Standing Investment index subset is based on completed and lettable properties only, often described as operating properties.
[3]The Non-Operating Investment index subset is constructed from those properties not included in the Standing Investments index subset. Non-operating Index base dates may differ as MSCI's client confidentiality rules suppress data based on small or skewed samples.

All three direct property indexes are computed at the building level and exclude properties held indirectly through investment funds, the impact of debt, fund management fees, taxation and cash. Numbers at sector level may not necessarily sum up to the 'Total' values due to rounding. For more details on MSCI's real estate indexes and methodology, please visit www.msci.com/real-estate

Dataset	MSCI/SCSI Ireland Annual Property Index (Unfrozen) published Annually			
Segment	All	All	Dublin - All	Dublin - All
Annualisation	Annual	Annual	Annual	Annual
Measure	Capital Growth	Cap. Growth Index	Capital Growth	Cap. Growth Index
Dec 1985	-6.6		-6.9	
Dec 1986	-2.0		-2.0	
Dec 1987	0.9		1.2	
Dec 1988	8.3		8.4	
Dec 1989	23.3		23.6	
Dec 1990	4.7		4.8	
Dec 1991	-6.6		-6.6	
Dec 1992	-9.1		-9.3	
Dec 1993	-1.8		-1.7	
Dec 1994	5.8	100.0	5.8	100.0
Dec 1995	4.1	104.1	4.3	104.3
Dec 1996	9.8	114.3	9.8	114.6
Dec 1997	16.4	133.1	16.1	133.0
Dec 1998	30.1	173.2	30.3	173.4
Dec 1999	24.8	216.1	25.6	217.7
Dec 2000	22.9	265.5	23.3	268.5
Dec 2001	2.8	273.1	2.6	275.4
Dec 2002	-2.2	267.0	-3.9	264.6
Dec 2003	7.0	285.6	6.2	281.1
Dec 2004	6.3	303.8	5.5	296.6
Dec 2005	19.0	361.5	19.0	353.0
Dec 2006	24.0	448.2	24.7	440.1
Dec 2007	5.7	473.7	6.2	467.4
Dec 2008	-38.2	292.5	-37.8	290.5
Dec 2009	-28.5	209.1	-28.7	207.0
Dec 2010	-10.6	187.0	-10.3	185.6
Dec 2011	-11.3	165.8	-11.0	165.1
Dec 2012	-6.3	155.4	-6.0	155.2
Dec 2013	2.8	159.8	3.9	161.2
Dec 2014	27.4	203.6	28.4	207.0
Dec 2015	18.8	241.9	19.3	246.9
Dec 2016	7.7	260.5	7.7	266.0
Dec 2017	3.4	269.3	3.6	275.5
Dec 2018	4.9	282.5	5.1	289.5
Dec 2019	0.7	284.5	0.8	291.8
Dec 2020	-5.9	267.8	-5.9	274.5
Dec 2021	0.4	268.8	0.4	275.6
Dec 2022	-4.3	257.2	-4.4	263.4

Growth	Index
Correl.	Correl.
0.999469	0.998738



ANNEX II

Residential Property Price Indices

Irish Residential Property Price Indices

The indices used in this report are produced by the Irish Central Statistical Office. Summary details are provided below.

Definition

The Residential Property Price Index (RPPI) is designed to measure the change in the average level of prices paid by households for residential properties sold in Ireland. The RPPI specifically excludes non-household purchases, non-market purchases and self-builds (i.e. where the land is purchased separately). The index is mix-adjusted to allow for the fact that different types of property are sold in different months.

Data Sources

The RPPI is compiled from a variety of data sources. The principal data source is stamp duty returns made to the Revenue Commissioners.

Quality Adjustment

Residential properties are heterogeneous, meaning that no two houses or apartments are identical. This poses a challenge when trying to construct a price index as there is a need to separate pure price change from differences in the quality and mix of the products being bought over time. Typically, this is done by comparing the prices of exactly the same products, time after time. For example, this is the method used in the Consumer Price Index, where a fixed basket of consumer goods is re-priced every month. However, in the case of residential properties, price is determined by many characteristics (location, size, dwelling type etc.) which make direct price comparisons difficult. Furthermore, only a small portion of the total housing stock is sold in any given month. The combination of these factors means that the price comparison process that would typically be used to calculate a price index cannot be used in the case of houses and apartments.

The hedonic method is the prevalent statistical process for the measurement of change of residential property price. In this method, transactions over two or more successive periods are pooled and the characteristics which influence price (dwelling type, dwelling size, geographical location and neighbourhood quality) are analysed and their relative contributions to the overall price are estimated. By excluding the price change determined by these characteristics independently, we are left with a pure price change for a consistent set of characteristics from one time period to another - or more simply - a residential property price index. This index uses a rolling 12-month hedonic regression model.

Data Smoothing

To mitigate short-term volatility in the series and highlight longer-term trends the published indices are smoothed using a double-exponential data smoothing technique. However, care should still be taken when interpreting monthly changes which may indicate residual short-term volatility rather than underlying change in longer-term price trends.

Full details of the RPPI methodology and coverage can be found at

https://www.cso.ie/en/statistics/prices/residentialpropertypriceindex/

ANNEX III

Baseline Economic Scenario

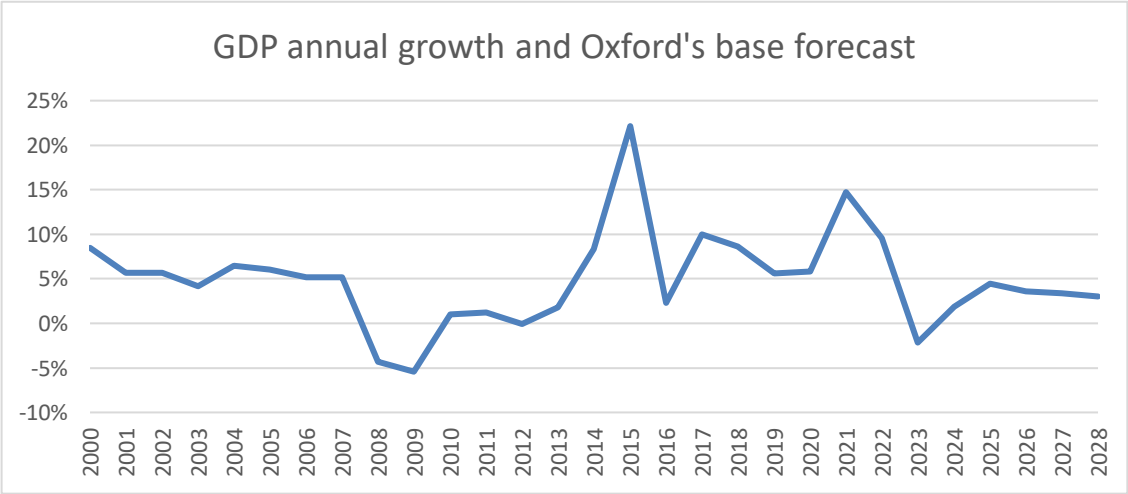
Economic scenario used to prepare the forecasts

1. The forecasts for the economic independent variables in this exercise have come from Oxford Economics, Avison Young's preferred forecast provider on a general basis.

2. It has been widely acknowledged the official GDP figures of the Republic of Ireland are distorted by the impact of 'base erosion and profit shifting' tax strategies of large multi-national corporations. Oxford Economics does not forecast the Modified Gross National Income or GNI* measure of output, created in response to these tax distortions. However, they do exclude the effect of international profit movement through Ireland from their GDP forecast, focusing instead on the typical components of national output.

3. While none of our property market models use GDP as an independent variable, the indicators we have used will to some extent be shaped by GDP growth. Oxford Economics forecast real GDP growth averaging 3.3% p.a. over the forecast period of 2024 to 2028 versus a historical 10-year average of around 9% (over 2013-2022). The main arguments behind this are that global trade growth is projected to be lower and that the Irish economy has reached a degree of optimum performance with limited spare capacity, making it difficult to see how very high levels of GDP growth achieved in the past can now be sustained.

4. Oxford's outlook for GDP appears now more in line with the alternative GDP scenario we asked them to prepare for us last year and the consensus view produced by other forecasters. We consequently use Oxford's scenario as our baseline/ main scenario and we do not run an alternative one.



Source: Oxford Economics

5. The table below presents Oxford Economics main economic assumptions used in our Baseline scenario

	GDP growth	Consumer spending	Employment growth	Unemployment rate	CPI inflation
2022	9.5%	9.6%	6.6%	4.5%	7.8%
2023	-2.1%	3.3%	3.7%	4.4%	6.3%
2024	1.8%	2.0%	1.7%	4.9%	1.9%
2025	4.5%	1.9%	1.5%	4.9%	1.2%
2026	3.6%	1.9%	1.4%	5.0%	1.5%
2027	3.4%	1.8%	1.3%	5.0%	1.7%
2028	3.0%	1.8%	1.2%	5.0%	1.8%
2013-22 average	8.9%	2.8%	3.1%	7.8%	1.2%
2024-28 average	3.3%	1.9%	1.4%	5.0%	1.6%

Source: Oxford Economics, December 2023 forecasts

6. The Irish economy is expected to have contracted in 2023. This is mainly due to external factors rather than weakness in domestic demand.

7. For the 2024-28 forecast period, Oxford is predicting Irish GDP growth to rebound. Unemployment is projected to increase slightly partly driven by fast labour force growth. Employment growth and consumer spending are expected to be healthy, though lower to the historical trend, consistent with more moderate GDP growth.

ANNEX IV

Dublin residential model supplementary information

Residential Dublin detailed model output

Residential Dublin model	
Adjusted R-Square*: 0.84	
	Coefficients
Intercept	-0.06
Dublin work. age population growth (+1)	7.08
National employment growth	1.26

		Baseline Scenario		
		Resi price %	**Work. age population % (+1)**	**Employment %**
	2006	18.1%	3.1%	4.5%
	2007	5.6%	0.9%	4.2%
	2008	-9.2%	-0.7%	-1.0%
	2009	-24.5%	-1.1%	-8.3%
	2010	-17.0%	-1.2%	-4.5%
	2011	-16.0%	-0.9%	-1.9%
	2012	-11.6%	0.4%	-0.4%
	2013	9.7%	1.4%	2.9%
	2014	24.2%	1.7%	2.6%
	2015	9.9%	1.4%	3.5%
	2016	5.1%	1.0%	3.7%
	2017	9.5%	1.5%	2.8%
	2018	8.6%	1.9%	2.8%
	2019	0.0%	1.3%	3.0%
	2020	-0.5%	1.2%	-2.8%
	2021	7.3%	2.0%	6.0%
	2022	10.3%	2.1%	6.6%
	2023	0.9%	1.7%	3.7%
	2024	***6.8%***	***1.7%***	***1.7%***
	2025	***5.5%***	***1.5%***	***1.5%***
	2026	***4.3%***	***1.4%***	***1.4%***
	2027	***3.0%***	***1.2%***	***1.3%***
	2028	***1.8%***	***1.0%***	***1.2%***
Average 2014-23		7.2%	1.2%	2.6%
Average 2024-28		***4.2%***	*1.4%*	*1.4%*
Cumulative 2024-28		***23.1%***	*7.0%*	*7.3%*

ANNEX V

Ireland residential model supplementary information

Residential Ireland detailed model output

Residential Ireland model	
Adjusted R-Square*: 0.76	
	Coefficients
Intercept	-0.01
Resi price growth (-1)	0.37
Employment growth	1.83

		Baseline Scenario		
		Resi price %	**Resi price Ireland (-1) %**	**Employment %**
	2006	14.9%		4.5%
	2007	7.5%	14.9%	4.2%
	2008	-6.9%	7.5%	-1.0%
	2009	-19.1%	-6.9%	-8.3%
	2010	-13.4%	-19.1%	-4.5%
	2011	-17.1%	-13.4%	-1.9%
	2012	-13.5%	-17.1%	-0.4%
	2013	1.2%	-13.5%	2.9%
	2014	16.5%	1.2%	2.6%
	2015	11.5%	16.5%	3.5%
	2016	7.5%	11.5%	3.7%
	2017	10.9%	7.5%	2.8%
	2018	10.2%	10.9%	2.8%
	2019	2.3%	10.2%	3.0%
	2020	0.3%	2.3%	-2.8%
	2021	8.3%	0.3%	6.0%
	2022	12.3%	8.3%	6.6%
	2023	1.2%	12.3%	3.7%
	2024	***2.2%***	***1.2%***	***1.7%***
	2025	***2.1%***	***2.2%***	***1.5%***
	2026	***1.8%***	***2.1%***	***1.4%***
	2027	***1.5%***	***1.8%***	***1.3%***
	2028	***1.3%***	***1.5%***	***1.2%***
Average 2014-23		7.7%	8.0%	2.6%
Average 2024-28		***1.8%***	*1.8%*	*1.4%*
Cumulative 2024-28		***9.2%***	*9.1%*	*7.3%*

ANNEX VI

Dublin office model supplementary information

Dublin Office detailed model output

Office model	
Adjusted R-Square*: 0.72	
	Coefficients
Intercept	0.01
Employment growth (+1)	1.67
Change in unemployment	-0.38
Change in 10-yr govt.bonds (-1)	-0.03

		Baseline scenario			
		Office capital value %	**Employment % (+1)**	**% change in unemployment**	**Change in govt bonds in bps (-1)**
	1985	-7.2%	0.7%	0.0%	0.0%
	1986	-2.3%	0.9%	0.7%	157.0%
	1987	-0.3%	0.0%	-1.6%	28.0%
	1988	7.0%	-0.2%	-3.8%	-187.0%
	1989	24.2%	4.3%	-9.4%	-8.0%
	1990	5.7%	-0.3%	-9.6%	113.0%
	1991	-7.0%	0.3%	10.4%	-96.0%
	1992	-10.4%	1.5%	4.0%	-12.0%
	1993	-3.0%	3.1%	2.2%	-186.0%
	1994	4.9%	4.4%	-9.5%	101.0%
	1995	3.2%	3.7%	-13.6%	-20.0%
	1996	10.3%	3.9%	-5.0%	-100.0%
	1997	17.8%	11.4%	-10.6%	-105.0%
	1998	35.2%	6.6%	-28.3%	-131.0%
	1999	29.9%	4.4%	-24.8%	-13.0%
	2000	26.1%	2.8%	-23.9%	80.0%
	2001	2.0%	1.5%	-4.8%	-51.0%
	2002	-7.3%	1.9%	13.2%	0.0%
	2003	0.6%	3.3%	2.5%	-88.0%
	2004	1.7%	4.7%	-1.9%	-2.0%
	2005	18.0%	4.5%	-2.7%	-20.0%
	2006	25.7%	4.2%	3.0%	-13.0%
	2007	6.0%	-1.0%	4.8%	52.0%
	2008	-34.8%	-8.3%	36.2%	26.0%
	2009	-28.4%	-4.5%	85.8%	62.0%
	2010	-10.5%	-1.9%	15.4%	63.0%
	2011	-10.6%	-0.4%	5.5%	393.0%
	2012	-5.1%	2.9%	0.5%	-345.0%
	2013	7.3%	2.6%	-11.2%	-246.0%
	2014	30.3%	3.5%	-13.6%	-146.0%
	2015	22.0%	3.7%	-16.6%	-119.0%
	2016	8.0%	2.8%	-15.5%	-46.0%
	2017	4.8%	2.8%	-19.3%	10.0%
	2018	5.8%	3.0%	-14.5%	15.0%
	2019	1.9%	-2.8%	-13.8%	-62.0%
	2020	-1.6%	6.0%	17.1%	-40.0%
	2021	0.1%	6.6%	7.0%	13.0%
	2022	-6.8%	3.7%	-28.0%	169.0%
	2023	-13.3%	1.7%	-1.3%	115.0%
	2024	***0.2%***	***1.5%***	***9.9%***	***-19.0%***
	2025	***3.1%***	***1.4%***	***1.0%***	***-5.0%***
	2026	***2.8%***	***1.3%***	***1.0%***	***-3.0%***
	2027	***2.8%***	***1.2%***	***0.6%***	***-1.0%***
	2028	***2.9%***	***1.2%***	***0.0%***	***0.0%***
Average 2014-23		4.4%	3.1%	-10.7%	-0.09
Average 2024-28		***2.4%***	*1.3%*	*2.5%*	*-0.06*
Cumulative 2024-28		***12.4%***	*6.7%*	*12.9%*	*-0.28*

ANNEX VII

Dublin industrial model supplementary information

Dublin Industrial detailed model output

Industrial model	
Adjusted R-Square*: 0.84	
	Coefficients
Intercept	-0.06
Manufacturing employment growth (+1)	1.14
Retail sales volume growth	2.71

		Baseline Scenario		
		Industrial capital value	**Manuf. Employment % (+1)**	**Retail sales volume %**
	1985	-7.1%	3.5%	1.8%
	1986	-6.4%	-2.2%	-0.5%
	1987	-0.7%	0.8%	-1.4%
	1988	7.6%	2.6%	2.0%
	1989	24.9%	2.8%	4.8%
	1990	10.1%	1.4%	2.8%
	1991	-6.3%	-0.8%	-0.2%
	1992	-7.5%	0.6%	2.5%
	1993	1.3%	5.6%	1.3%
	1994	9.0%	4.4%	5.5%
	1995	4.3%	3.0%	2.9%
	1996	8.7%	-0.2%	8.0%
	1997	15.8%	7.4%	6.7%
	1998	19.0%	2.2%	7.8%
	1999	20.2%	2.4%	7.7%
	2000	16.6%	0.2%	8.3%
	2001	3.9%	-4.2%	5.9%
	2002	-6.5%	-2.5%	0.8%
	2003	0.2%	-2.0%	1.1%
	2004	1.8%	-2.1%	2.9%
	2005	10.2%	-0.1%	3.6%
	2006	25.6%	0.1%	7.8%
	2007	5.1%	-4.6%	7.2%
	2008	-29.2%	-10.5%	-2.2%
	2009	-27.8%	-6.6%	-6.8%
	2010	-12.5%	-1.5%	0.8%
	2011	-12.0%	-1.3%	-2.9%
	2012	-6.8%	4.2%	-0.9%
	2013	-2.2%	1.2%	1.2%
	2014	5.0%	5.7%	5.3%
	2015	11.8%	6.0%	5.7%
	2016	11.1%	1.3%	5.0%
	2017	2.0%	-1.1%	5.7%
	2018	6.8%	2.0%	3.7%
	2019	1.6%	2.8%	4.3%
	2020	2.7%	6.9%	0.4%
	2021	20.3%	2.3%	5.0%
	2022	4.1%	0.5%	1.9%
	2023	-4.1%	-0.1%	0.8%
	2024	***2.1%***	***1.0%***	***2.7%***
	2025	***3.8%***	***0.8%***	***3.4%***
	2026	***2.3%***	***0.6%***	***3.0%***
	2027	***1.9%***	***0.6%***	***2.8%***
	2028	***1.5%***	***0.5%***	***2.7%***
Average 2014-23		5.9%	2.6%	3.8%
Average 2024-28		***2.3%***	*0.7%*	*2.9%*
Cumulative 2024-28		***12.2%***	*3.7%*	*15.5%*

ANNEX VIII

Dublin retail model supplementary information

Dublin Retail detailed model output

Retail model	
Adjusted R-Square*: 0.63	
	Coefficients
Intercept	-0.11
Retail sales_volume	2.19
Retail sales_volume(+1)	1.99

		Baseline Scenario		
e		**Retail capital value %**	**Retail sales volume %**	**Retail sales volume % (+1)**
	1985	-5.7%	1.8%	-0.5%
	1986	0.9%	-0.5%	-1.4%
	1987	7.2%	-1.4%	2.0%
	1988	13.2%	2.0%	4.8%
	1989	22.0%	4.8%	2.8%
	1990	1.2%	2.8%	-0.2%
	1991	-5.9%	-0.2%	2.5%
	1992	-7.1%	2.5%	1.3%
	1993	0.6%	1.3%	5.5%
	1994	6.7%	5.5%	2.9%
	1995	6.3%	2.9%	8.0%
	1996	9.5%	8.0%	6.7%
	1997	13.4%	6.7%	7.8%
	1998	25.4%	7.8%	7.7%
	1999	17.1%	7.7%	8.3%
	2000	18.9%	8.3%	5.9%
	2001	3.6%	5.9%	0.8%
	2002	7.5%	0.8%	1.1%
	2003	23.3%	1.1%	2.9%
	2004	15.0%	2.9%	3.6%
	2005	24.0%	3.6%	7.8%
	2006	22.5%	7.8%	7.2%
	2007	6.7%	7.2%	-2.2%
	2008	-43.9%	-2.2%	-6.8%
	2009	-29.5%	-6.8%	0.8%
	2010	-9.6%	0.8%	-2.9%
	2011	-11.5%	-2.9%	-0.9%
	2012	-7.2%	-0.9%	1.2%
	2013	-0.3%	1.2%	5.3%
	2014	30.4%	5.3%	5.7%
	2015	15.0%	5.7%	5.0%
	2016	7.1%	5.0%	5.7%
	2017	0.9%	5.7%	3.7%
	2018	1.6%	3.7%	4.3%
	2019	-2.9%	4.3%	0.4%
	2020	-21.1%	0.4%	5.0%
	2021	-6.5%	5.0%	1.9%
	2022	-4.6%	1.9%	0.8%
	2023	-7.3%	0.8%	2.7%
	2024	***2.2%***	***2.7%***	***3.4%***
	2025	***2.8%***	***3.4%***	***3.0%***
	2026	***1.5%***	***3.0%***	***2.8%***
	2027	***0.9%***	***2.8%***	***2.7%***
	2028	***0.4%***	***2.7%***	***2.6%***
Average 2014-23		0.4%	3.8%	3.5%
Average 2024-28		***1.5%***	*2.9%*	*2.9%*
Cumulative 2024-28		***8.0%***	*15.5%*	*15.4%*

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