called "patent cliff") in their export projections.[19] In light of these clarifications, the Council viewed the export growth forecasts as within an appropriate range.

The Council remained concerned, however, about the internal consistency of the provisional final forecasts for personal consumption expenditure. Taking the published CSO quarterly estimates of a decline in consumption in 2012Q4 and 2013Q1 and modest growth in 2013Q2 as given, the Department's projections for annual growth in 2013 appeared to imply implausibly high growth rates in the third and fourth quarters of the year. The quarterly profile implied by taking the CSO data as given looked problematic even in the context of a likely bounce back in consumption in the second half of 2013 as a result of some sector-specific factors (discussed in Section 1.5.1). The relationship between annual growth rates and quarterly growth profiles is explored in more detail in Box C.


BOX C: ANNUAL GDP GROWTH AND CARRYOVER EFFECTS

The Budget includes forecasts for annual GDP and other variables, both in terms of their level and the growth rate between calendar years. Department of Finance forecasts are made for these annual aggregates.

This is a standard approach. However, it can lead to growth projections that are unintuitive or appear misleading given the irregular (seasonally-adjusted) pattern of quarterly growth in the economy measured in the National Accounts. Furthermore, an annual growth rate covers developments over 8 quarters and can therefore give a rather backward-looking picture of growth around turning points. Therefore, care is needed in interpreting annual growth forecasts as these may not closely match the underlying pattern in the quarterly data.

Taking a hypothetical example, the (seasonally-adjusted) aggregate in Figure C1 has an irregular pattern of growth. However, the aggregate clearly reaches a trough at the beginning of year t+1 and expands continuously thereafter to reach a higher level by the end of t+1 than at the end of period t. However, the annual average level over the four quarters of year t+1 is actually *lower* than it was in period t and therefore the annual growth rate registers a *contraction* between t+1 and t, despite the recovery that is occurring during that year. This is an example of how annual growth rates may present a misleading picture of the underlying quarterly developments.

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[19] Developments in the pharmaceuticals sector were already factored into the benchmark projections but in a different way.

FIGURE C1: AN ECONOMIC AGGREGATE WITH IRREGULAR DATA
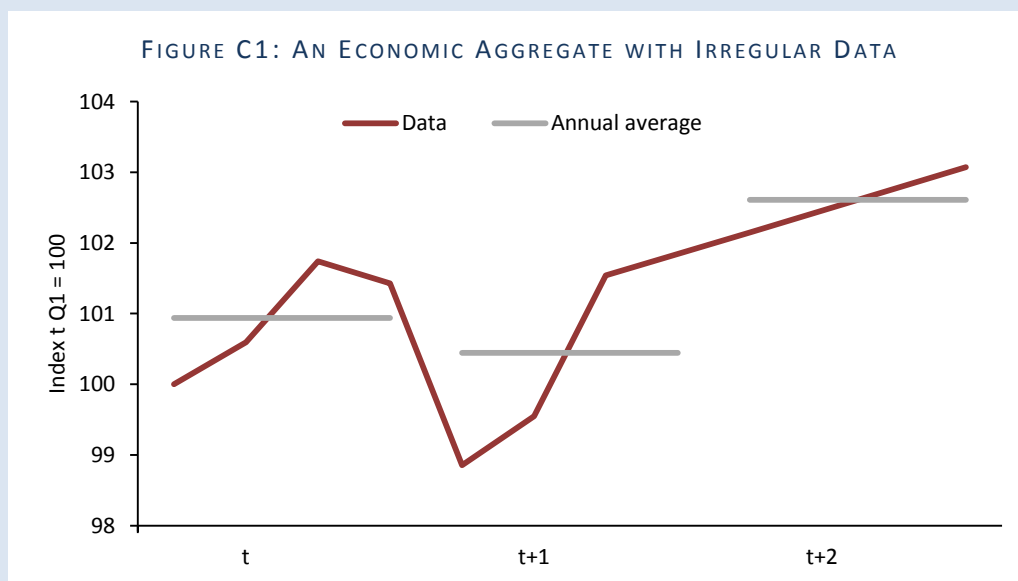
At the same time, the increase in the level of the aggregate during the course of year t+1 means that, even if the aggregate were to stay at that level it reaches by the end of t+1 throughout t+2, there would be a strong annual growth rate registered in t+2 even with no actual growth during the course of that year. This is known as the "carryover" effect.

For the example above, these effects are shown in Table C1.This shows the negative growth measured on an annual growth basis in t+1 and the very strong growth in t+2, despite only modest assumed quarterly improvements during that year. The table also shows growth rates measured as the change between the fourth quarter of one year and the fourth quarter of the preceding year. This can give a clearer picture of how much the economy has grown during the course of the year.

TABLE C1: HYPOTHETICAL EXAMPLE OF GROWTH AND CARRYOVERS

% Change	t	t+1	t+2
Annual Growth	-0.3	-0.5	2.2
Of which carryover		0.5	1.4
Q4/Q4 Growth	0.8	0.4	1.2

An implication of carryover effects is that annual growth rates are very sensitive to growth rates in the early quarters of the year – varying one-for-one with growth in the first quarter (other things equal) – but depending much less on developments towards the end of the year (varying one-for-four with growth in the fourth quarter). However, the carryover for the following year is strongly affected by growth in the final quarters of the previous year.

It is important for forecasts to reflect these underlying developments in quarterly terms in the formulation of annual growth projections. Otherwise, there is a risk that annual growth rates that seem reasonable actually imply quarterly growth profiles that are implausible, suggesting that the annual growth forecasts are in fact unlikely. While a lot of the variation in early CSO estimates of the quarterly profile may be revised away, much of the volatility in expenditure from quarter-to-quarter is a real feature of a volatile economy such as Ireland's and needs to be taken into account for annual forecasts to be accurate.