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INDEXATION, COUNTERFACTUALS, AND FORECASTING: DEALING WITH VOLATILE INFLATION

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A Guide for Project Sponsors, Contractors, Lawyers, Investors, and Regulators

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DEALING WITH THE CHALLENGE OF INFLATION

After around 30 years of relative stability, inflation has made a resounding comeback, playing havoc with economies around the world. The COVID-19 pandemic, supply-chain disruptions, and the Russia-Ukraine War have all contributed. Even though the current inflation outlook seems to have eased and a degree of stability has returned, recent events have shown inflationary pressures can change rapidly and dramatically: The next inflationary crisis could be just around the corner. In this paper, we consider the implications of this change in the inflationary environment on commercial infrastructure contracts.

INFLATION MEASURES RESPOND DIFFERENTLY TO ECONOMIC SHOCKS

In the UK, the Office for National Statistics (ONS) monitors inflation using various measures:

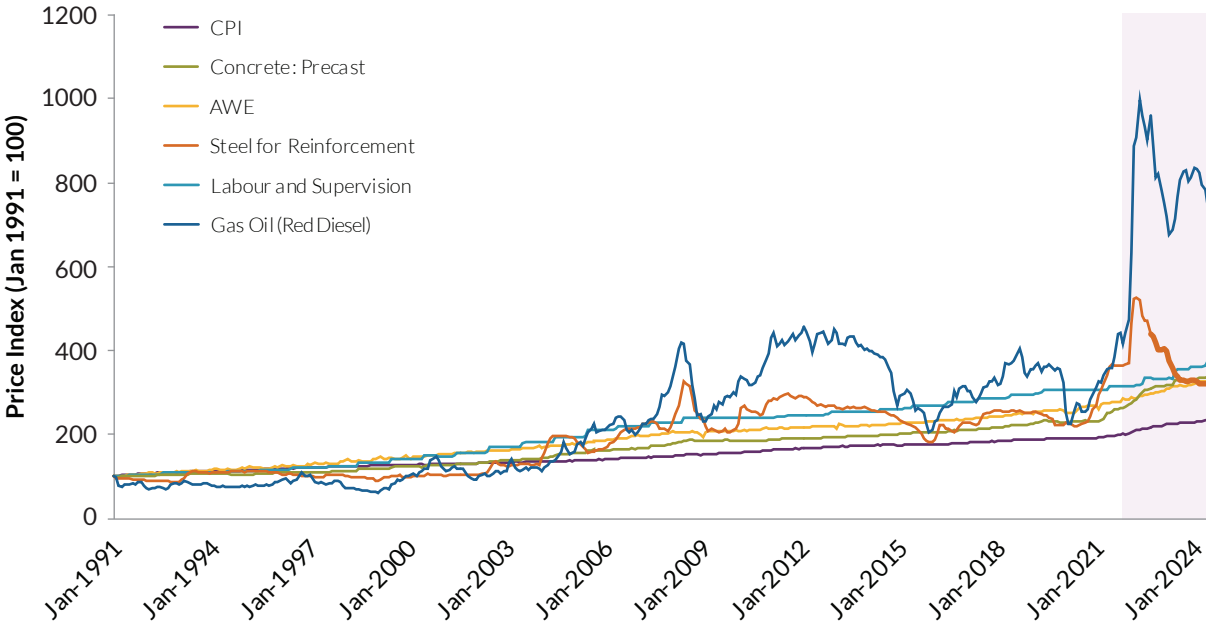
- **Consumer Price Index (CPI)** is the most widely recognised. It tracks the price of a basket of goods and services purchased by a typical consumer and is used by the Bank of England (BoE) as a target when setting monetary policy.
- **Gross Domestic Product (GDP) deflator** is a comprehensive measure that assesses changes in the prices of all domestically produced goods and services.
- **Producer Price Index (PPI)** is used to assess inflation at the wholesale level. It measures the average change over time in the prices domestic producers pay for their inputs (PPI input) and receive for output (PPI output).

Between 2010 and Q2 2024, UK PPI increased, with input prices increasing by 47% and output prices by 44%, while the CPI and GDP deflator increased by 46% and 42%, respectively.[1] These inflation measures tend to differ because they capture price changes in different parts of the economy.

This disparity between general measures of inflation and the inflation of business-specific baskets can be important, particularly for stakeholders involved in long-running commercial infrastructure contracts. These infrastructure projects tend to be large, run over many years, and require specific resources and commodities, many of which have recently experienced higher and more variable inflation than general inflation.

For example, the Russia-Ukraine War had a significant impact on energy prices. Inflation rates for energy-related resources, which are an important input in infrastructure projects, exceeded general economy-wide inflation; for example, between April 2021 and March 2022, gas experienced inflation approximately 22 times higher than the CPI (as shown in Figure 1).[2] Inflation for commodities that are important for infrastructure projects has also been volatile. For example, steel prices fell at a rate of approximately 18% in 2023 and 3% in the first half of 2024, following a substantial inflationary surge of 10% in 2022.[3] Moreover, given conflict in the Middle East, the future of oil prices and resilience of supply chains is uncertain.

Figure 1. **Monthly Indices Before and Since the Start of the Russia-Ukraine War**



Inflation Snapshot

	2022	2023	2024 until July
CPI	9%	4%	3%
AWE	6%	6%	3%
Labour and Supervision	6%	9%	4%
Concrete	18%	5%	3%
Steel	10%	-18%	-3%
Fuel	85%	-1%	-9%

Source: NERA analysis of BCIS and ONS data.
Note: AWE is Average Weekly Earnings (ONS). Labour and Supervision index is BCIS. In the inflation snapshot table, the cells are shaded based on the magnitude of the inflation. 2022 and 2023 are based on Dec–Dec % y/y growth in indices, and 2024 is based on Dec–Jul due to data availability.

HOW CAN INDEXATION BE USED TO LIMIT INFLATION EXPOSURE?

In commercial infrastructure projects, payments and costs account for inflation using indexation mechanisms, which are intended to ensure the payments or costs move in line with relevant inflation.

Two main approaches can be used:

- **Economy-wide indexation**: Adjusting payments or costs based on an economy-wide price index, such as CPI or PPI.
- **Project-specific indexation**: Adjusting payments or costs based on a project-specific price index related to a particular group of products. For example, if an infrastructure project uses a lot of concrete and steel, then price indices for these products would be combined to develop a project-specific inflation index.

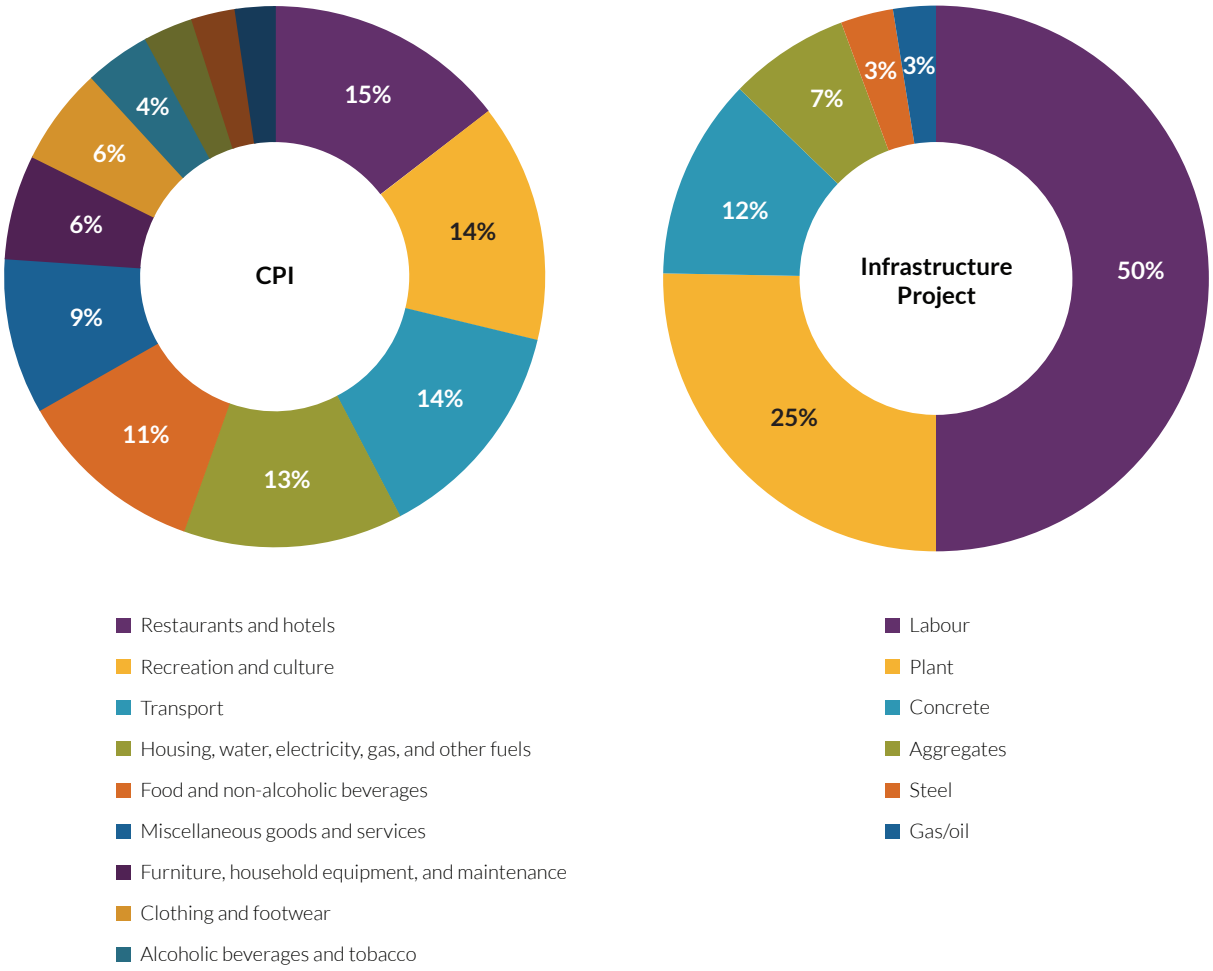
Economy-wide price indexation might sometimes be appropriate for small-scale infrastructure projects with generalised input baskets that can be completed in a short period of time under conditions of stable inflation. However, for larger and longer-term infrastructure projects with specific input baskets, using a project-specific index to accurately determine cost changes over time can be crucial. Regulators in the UK, such as Ofgem, also recognise input costs grow at a different rate than economy-wide inflation by allowing regulated companies an extra allowance to account for real price effects (RPEs).[4]

WHICH INDEXATION APPROACH IS APPROPRIATE?

Given today's rapidly changing inflationary environment, it is more important than ever to choose an indexation approach that is representative of the 'basket of goods' used in the infrastructure project. The consequences of using unrepresentative indices can be severe.

Economy-wide price indices typically do not correspond to an infrastructure project's basket. Figure 2 shows the composition of the CPI basket (an economy-wide index that reflects inflation faced by an average consumer) compared with a typical basket for a construction project.[5] CPI includes a significant proportion of goods that are not relevant to infrastructure projects, such as food and beverages (11% of the CPI basket). In contrast, a construction project's typical basket is heavily weighted towards labour and commodities.

Figure 2. **Decomposition of CPI and Typical Basket for a Construction Project**

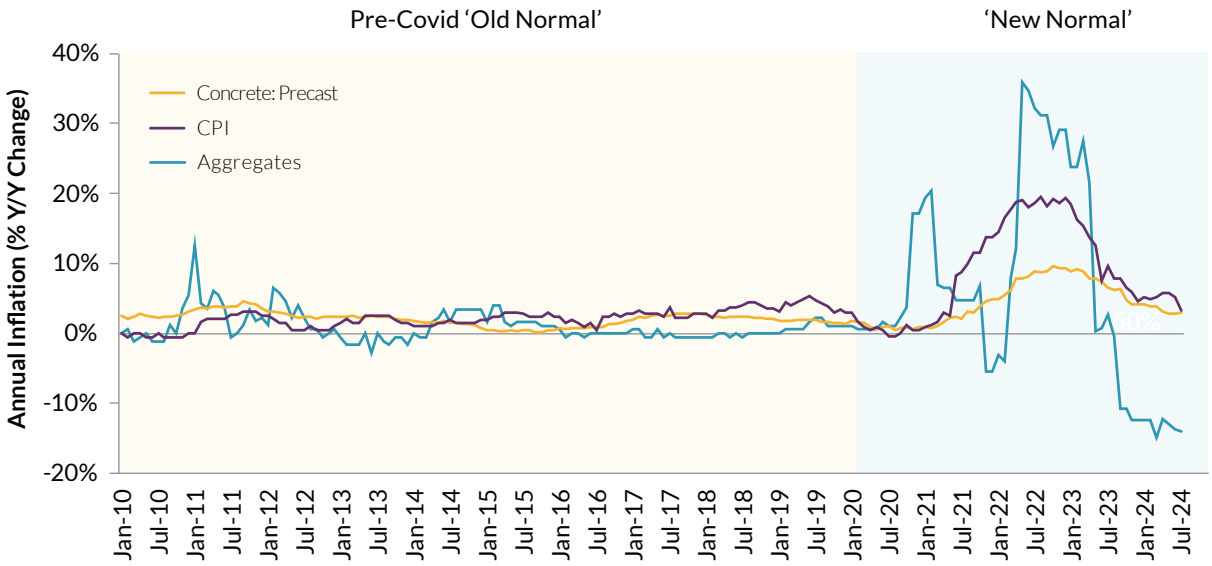


Source: NERA analysis of ONS (2024) and illustrative infrastructure project.

The disparity between movements in CPI and movements in commodity-specific indices can be significant, particularly during or immediately after economic shocks. Figure 3 illustrates the contrast between annual CPI inflation and commodity-specific (aggregates or concrete) annual inflation. The recent disparities in the observed annual inflation rates have been influenced heavily by the effects of COVID-19 and the Russia-Ukraine War. Commodity prices reacted to these external shocks differently from general measures of inflation.

Indeed, even during 'normal' periods, the differences between general inflation and resource-specific inflation can be significant (e.g., due to changes in labour productivity, technological change, and the fundamental availability of key resources).

Figure 3. **CPI vs. Construction-Specific Indices**



Inflation Snapshot

	Pre-Covid	New Normal
CPI	2.06%	4.46%
Aggregates	0.98%	6.38%
Concrete	2.13%	8.73%

Source: NERA analysis of BCIS and ONS data. Chart shows the annual inflation (% year-on-year change in monthly indices). Inflation snapshot table shows average annual inflation for Pre-Covid (Jan-10–Jan-20) and New Normal (Feb-20–Jul-24) periods. In the inflation snapshot table, the cells are shaded based on magnitude of inflation.

THE IMPORTANCE OF FORECASTING

Forecasting project-specific inflation is essential for businesses making decisions about long-term projects, as it can significantly impact project budgets. This is true even in the absence of substantial inflationary shocks, as differences compound over time.

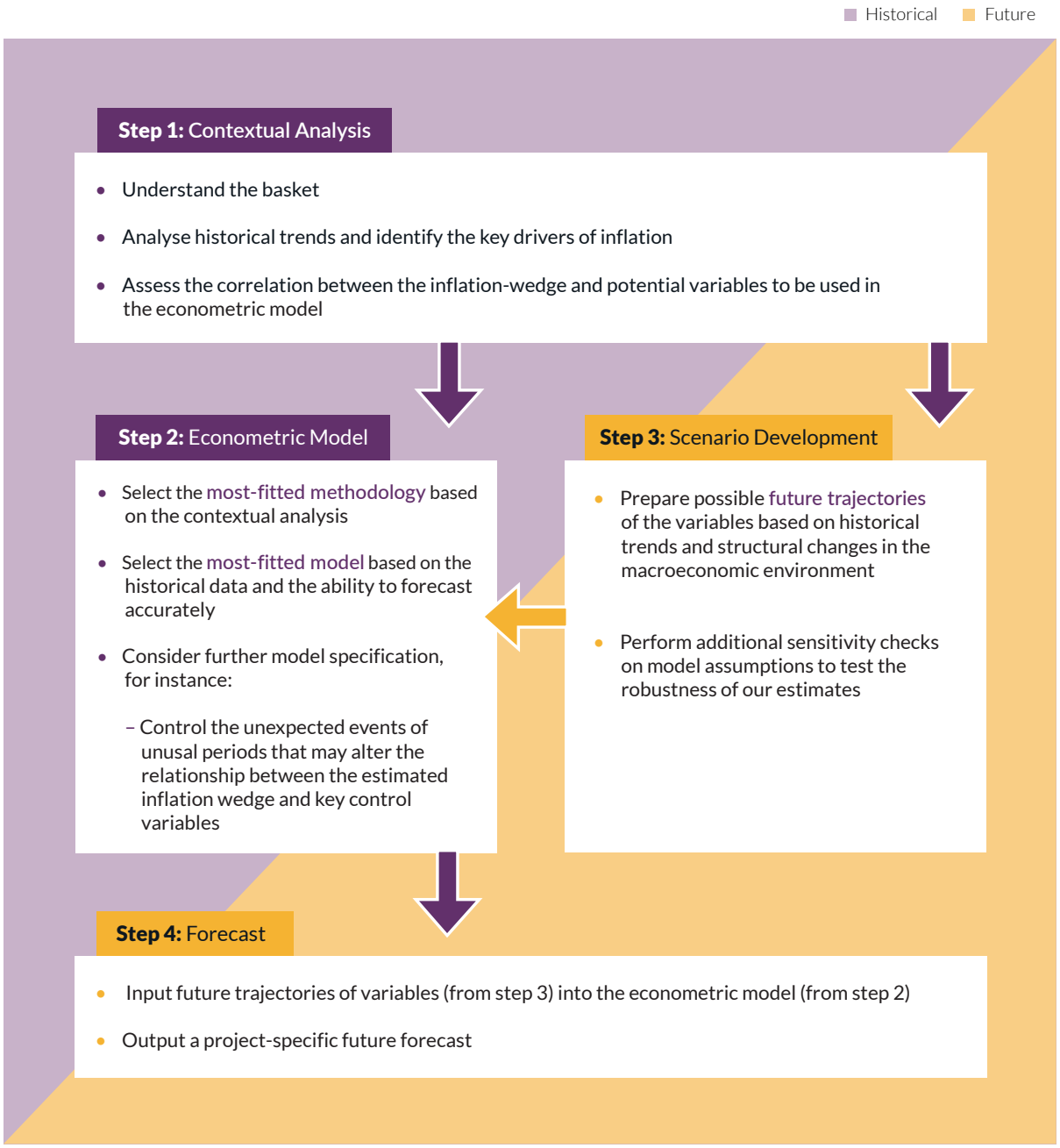
For long-term projects, specialised forecasting models can be extremely valuable. These models can use econometrics to explain and forecast the "wedge" between project-specific and economy-wide inflation indices. Since it is unrealistic to forecast inflation too far into the future—OBR forecasts CPI three to four years ahead[6]—our experience is that it can be more practical to focus on forecasting the wedge between inflation indices.

A bespoke econometric model can establish the historic relationship between (i) the inflation wedge and (ii) its key drivers. Formulating a robust model involves analysing historical data, exploring the relationship between inflation and its drivers, and developing a regression model that reflects the underlying economic theory. The model should also be transparent and easy to understand, rather than unclear and opaque like a black box.

We explain the main steps of how to develop an inflation wedge forecasting model in Figure 4.

- *Step 1 – Contextual Analysis*: By conducting a comprehensive analysis of historical inflation patterns, we can identify the primary drivers of inflation related to commodity-specific resources, macroeconomic factors, and market variables. This analysis enables us to compare these key drivers with economy-wide inflation and better understand the underlying relationships between them.
- *Step 2 – Econometric Model*: By leveraging historical relationships between macroeconomic variables (e.g., GDP growth, unemployment rate, exchange rate, and energy prices) and the project-specific inflation wedge, we can develop a bespoke econometric model that quantifies the impact each key driver of inflation has on the project-specific inflation wedge.
- *Step 3 – Scenario Development*: Following the contextual analysis and review of the economic environment, we can develop future scenarios for the key explanatory variables in our model. The projected trajectories of these variables can then be used as inputs to generate alternative forecasts, in a flexible way.
- *Step 4 – Forecast*: By incorporating the scenarios developed in Step 3 into the econometric model, we can derive robust forecasts of project-specific inflation, ensuring an accurate representation of future inflation dynamics.

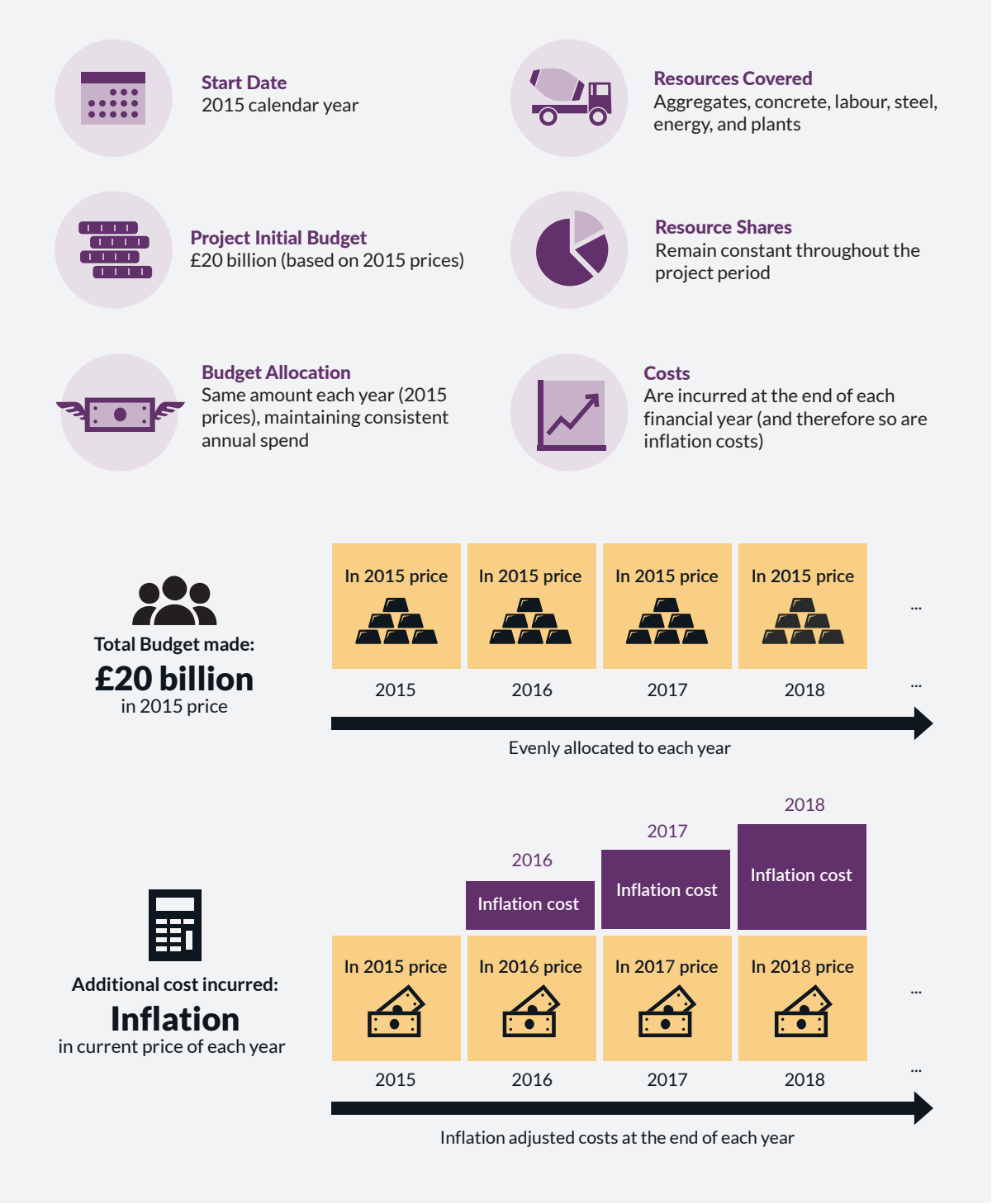
Figure 4. Econometric Approach to Inflation Forecasting



Source: NERA illustration.

The process of forecasting inflation requires a robust approach as small inaccuracies can compound over time, leading to significant discrepancies, especially in long-term infrastructure projects. Historical relationships and models based on data from previous decades may no longer be valid. An agile approach is therefore necessary.

Figure 5. A Stylised Example



Source: NERA illustration.
Notes: Resource allocations are hypothetical but informed by actual expenditure profiles from real-world infrastructure projects we have previously assessed.

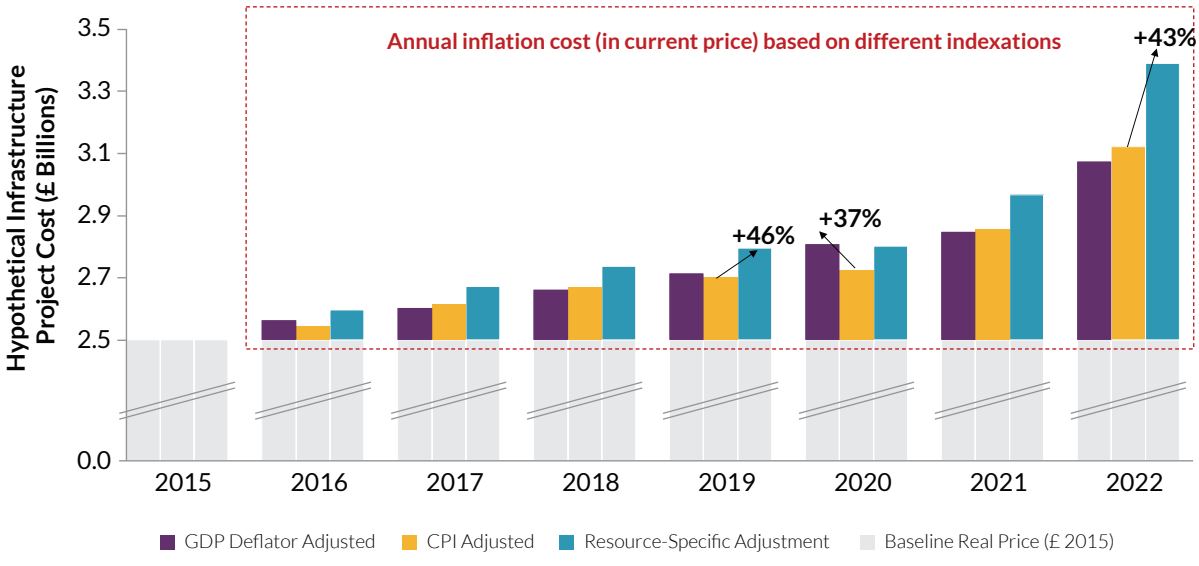
THE FINANCIAL IMPACT OF USING DIFFERENT INDEXATION APPROACHES

Using the stylised example from Figure 5, we consider two economy-wide inflation measures (CPI and the GDP deflator) and a project-specific index based on the actual costs incurred on the project. As seen in Figure 6, different indices yield different results:

- **Between economy-wide indices**. The purple and yellow bars, representing inflation costs in current prices based on the GDP deflator and CPI, respectively, reveal relatively similar cost sizes during a 'normal' period before 2020. However, this changes in 2020. Choosing the GDP deflator for indexation could result in a 37% higher escalation in cost compared to using the CPI. Given the example project's scale, this translates to a variance of £83 million in 2020 prices. This suggests, even when basing an inflation indexation approach on economy-wide indices, the choice of index can be important and have significant financial impact.
- **Between economy-wide and project specific indices**. In 2019, the actual inflation costs (as measured by a project specific index) were 46% higher than when relying on the CPI (economy-wide index). This difference was 43% in 2022, primarily because of the high inflation for several resource categories affected by geopolitical events.

This shows the importance of choosing the right inflation index.

Figure 6. **Annual Inflation Costs of a Construction Project with Different Measures of Inflation**



Source: NERA calculation based on the stylised example using ONS and RICS BCIS data.

ECONOMY-WIDE INDEXATION IS NOT ENOUGH TO COVER FORCE MAJEURE EVENTS

In real-world commercial contracts, we often see indexation based on economy-wide indices such as CPI or the GDP deflator. While contracts using economy-wide indexation may sometimes cover inflation costs in 'normal' times, force majeure events—such as COVID-19 or the Russia-Ukraine War—can lead to construction costs rising significantly beyond what these economy-wide indices reflect.[7] As a result, additional compensation may be required to address these unique inflationary pressures.

This is especially important for contracts established during periods of low and stable inflation (i.e., prior to 2020). Although these contracts may include some protection against inflation (through a standard economy-wide indexation mechanism), this protection is unlikely to fully cover against the actual inflation costs experienced.

In this situation, the key to any force majeure claim is to understand:

1. How much inflation impact has been caused by the force majeure event (e.g., the Russia-Ukraine War or COVID-19) rather than anything else?

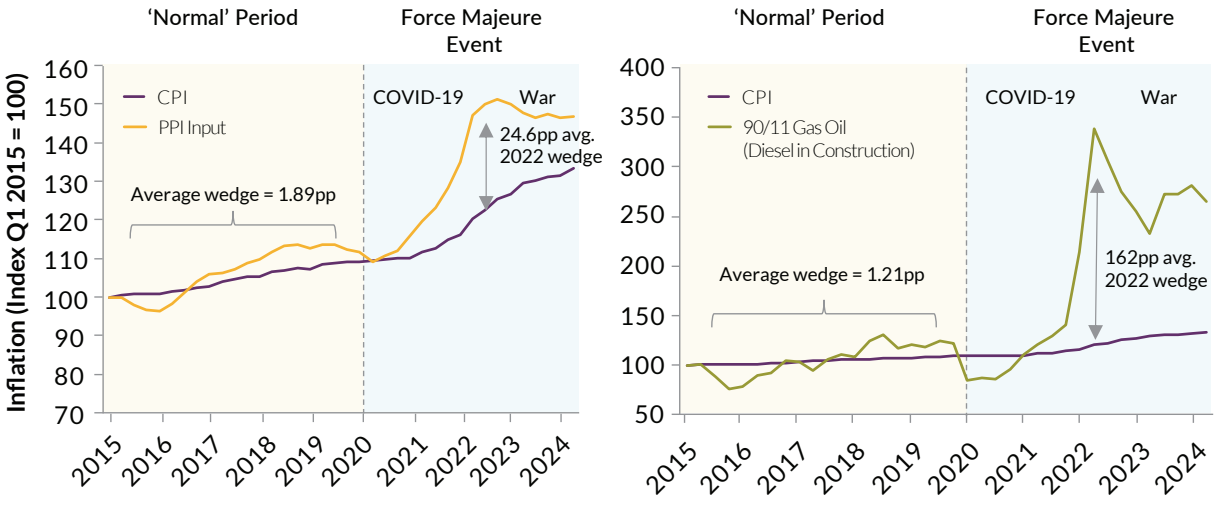
2. To what extent is this covered through the indexation mechanism already in the contract?

To answer the first question, a counterfactual scenario is needed (i.e., an assessment of the level of inflation the infrastructure project would have faced if the force majeure event had not occurred). A force majeure induced inflation index can then be calculated by analysing the difference between (i) the actual inflation experienced and (ii) inflation faced in the counterfactual scenario. This index can then be applied to the base level of spending to cover inflation that has been caused by the force majeure event.

When developing a force majeure induced inflation index, it is crucial to consider the project-specific basket of resources and the inflationary impact of the force majeure event on that basket. This is due to the substantial decoupling that often occurs between project-specific inflation indices and economy-wide inflation during crises or force majeure events, where inflation in project-specific resources (e.g., metals and oil) can be significantly higher than economy-wide inflation measures.

This decoupling can be observed in Figure 7, which first shows the significant divergence between the CPI and the Input Producer Price Index (Input PPI), which tracks prices of inputs used by firms in production (a relatively imprecise measure of infrastructure project-specific inflation). Before COVID-19, the average difference between the CPI and Input PPI was 1.18 pp. However, in 2022, this difference surged to 24.6 pp. Figure 7 also shows the decoupling effect can be particularly pronounced for very specific resources, for example for gas oil, which is a common input in infrastructure projects.

Figure 7. **Inflationary Trends in CPI, PPI, and Gas Oil from 2015 Until Present**



Source: NERA analysis of ONS and BCIS data.

The following approaches exist to analyse the impact of force majeure events on project-specific inflation in this way:

- **Approach 1: Utilise relevant resource-specific forecasts**. If available, use forecasts of resource-specific indices or futures prices of specific commodities estimated immediately prior to the force majeure event. Compare those forecast prices to the actual prices observed during the force majeure event to determine the inflationary impact. While forecasts are rarely perfect, they can provide a clean, simple, and reasonable basis for the development of counterfactuals.
- **Approach 2: Analyse the change in wedge between economy-wide inflation and project-specific inflation**. If resource-specific forecasts are not available, examine the change in the wedge between the CPI and the project-specific index before and after the force majeure event occurred. The difference in the wedges can be used to gauge the force majeure's impact on project-specific inflation, net of the effects on economy-wide inflation. This approach assumes, in the counterfactual scenario, the wedge between economy-wide and project-specific inflation would have remained in line with historical trends prior to the force majeure event. Approach 2 also provides a simple, fast, and reasonable basis for the development of counterfactuals when forecasts of resource-specific inflation are not available.
- **Approach 3: Conduct econometric analysis**. This method is similar to Approach 1 but uses forecasts for project-specific inflation developed from a bespoke econometric model rather than publicly available resource-specific forecasts. Bespoke econometric inflation forecasting models can be developed to create a counterfactual scenario by training the model on pre-force majeure data, leveraging relationships between inflation and key macroeconomic drivers in 'normal' times. The model can then forecast (or rather "counter-cast") counterfactual levels of inflation, which can be compared with actual inflation levels to determine how much inflation was caused by the force majeure event. Approach 3 is more sophisticated and is ideal when there are sufficient historical data available to develop a bespoke econometric model. Econometric models can capture the relationships between project-specific inflation and key macroeconomic drivers, allowing for a more tailored and precise analysis.

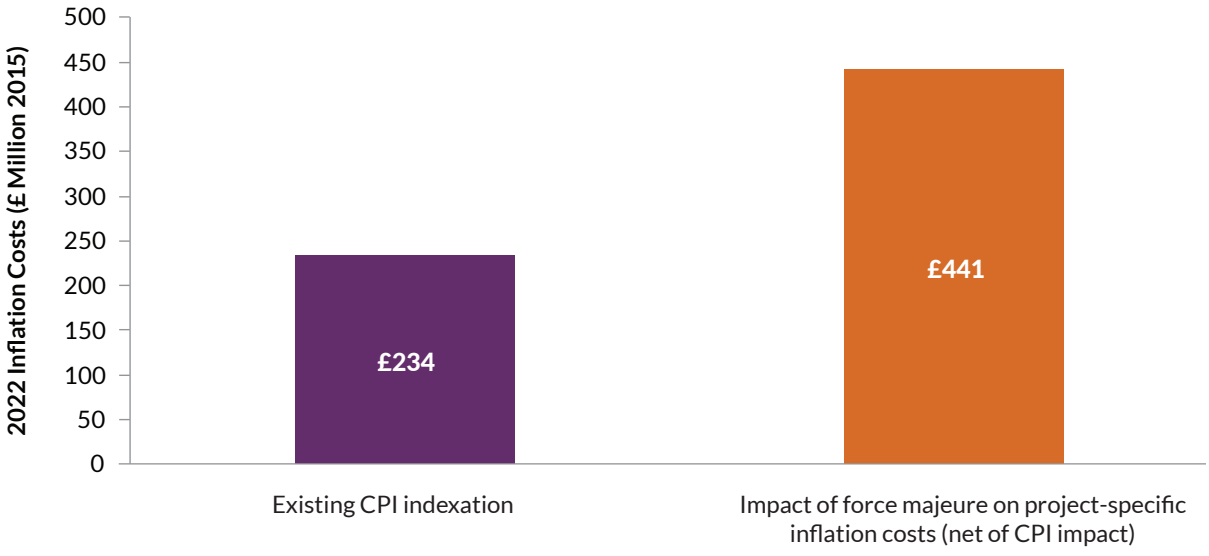
We have worked closely with infrastructure developers to analyse these methods and implement them effectively.

In the following, we discuss how compensation can be quantified in a force majeure situation using the same stylised infrastructure project discussed in Figure 5. Along with the assumptions highlighted in Figure 5, we assume the contract had an existing indexation mechanism based on CPI. We do this by analysing how much project-specific inflation was caused by the two force majeure events (COVID-19 and the Russia-Ukraine War) rather than other factors. For simplicity we focus only on developing a claim for inflation costs in 2022.

To answer this question, we use Approach 2. Specifically, we utilise the project-specific index to assess the change in wedge between project-specific inflation and economy-wide inflation before the force majeure events and during 2022. The change in the wedge is then attributed to the impact of the force majeure events on project-specific inflation, excluding the effects on economy-wide inflation.

Figure 8 illustrates that the existing indexation mechanism based on CPI initially covers £234 million of inflation costs. However, using the project-specific basket and Approach 2, the force majeure events are estimated to directly increase project-specific inflation costs by £441 million, beyond the impact of the force majeure event on economy-wide inflation (this £441 million represents about 15% of the project's baseline spending in 2022).

Figure 8. **Force Majeure Claim for 2022**



Source: NERA analysis and BCIS, ONS, and OBR data.

OUR EXPERTISE AND SOLUTIONS

Measuring, forecasting, and indexing inflation is challenging but needs to be done properly, as the stakes are so high.

Our experts at NERA are highly skilled economists with substantial experience in the area. We have worked on these issues with project sponsors, firms, investors, lawyers, and regulators across various infrastructure projects around the world, and we have extensive experience advising on force majeure and related claims. For more information on how we can help, please get in touch.

NOTES

1 Increases from Q4 2010 to Q2 2024.

2 CPI grew 7% between April 2021 and March 2022, while gas prices grew 160% (22 times more).

3 NERA analysis of Building Cost Information Service (BCIS) data.

4 Real price effects (RPE) are defined as the differential between input price inflation and economy-wide inflation as measured by the RPI or CPIH indices.

5 Percentages are for illustrative purposes and have been adapted based on resource shares from a real-world infrastructure project.

6 OBR Inflation Forecast, May 2024, available at https://obr.uk/forecasts-in-depth/the-economy-forecast/inflation/.

7 Force majeure clauses usually describe an 'exceptional event or circumstance' beyond the reasonable control of the parties involved.

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