Uses and Misuses of Inflation and Price Indices

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By

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Preface

Consumer price inflation is arguably the most important of economic indicators. It has a special significance, both through its role in the overall management of the economy and its use in wage negotiations and the adjustment of pensions, benefits and many thresholds.

In the UK, inflation statistics are produced and published monthly by the Office for National Statistics and are watched closely. They are always reported in the media and often form the lead item on their day of release. Many newspaper articles are written explaining the significance of the latest values, how they have changed over time and what the future might hold. While modest levels of inflation are considered good for the economy, higher levels are very damaging; governments and central banks strive to keep inflation under control.

Inflation statistics are a part of the overall family of official statistics which include data on the economy, the labour market, the population, business and many other topics. New official figures are published almost every day of the year. What the statistics tell us is of widespread interest but the way they are constructed is not. Most official statistics are treated as if they are part of the furniture. They are produced each month, quarter or year, and are accepted at face value by the organisations and individuals who use them. This can be taken as an indication that the producers are considered trustworthy; trust and a high level of quality are what are required of official statistics. However, very occasionally, the way that official statistics are calculated and used attracts public criticism. Inflation statistics in the UK fall into this category.

A series of events, some originating in other parts of the world, led to competing measures of inflation in the UK and much argument over which is best; the debate has lasted over twenty years. The disputed use of inflation statistics has resulted in independent reviews, public consultations, the intervention of the Royal Statistical Society, parliamentary inquiries and multiple court cases. A proposed resolution is in sight, but won't be implemented until at least 2030. Even then, it is unlikely to bring the debate to an end. The story behind the events and decisions that led to this undesirable position is a compelling one.

What is this book about?

This book has been designed to cover the range of topics relevant to understanding what inflation is, how it has varied over recent times, how it is measured, how inflation measures are used, why they are controversial and their origins.

The calculations involved in producing inflation statistics are complex and use much mathematics, economics and statistics; they have benefitted from the combination of extensive fundamental research and many years of practical application. We avoid mathematical details in this book and instead describe the principles behind the construction and usage. For technically minded readers, we provide a short mathematical appendix.

We have previously written in-depth accounts of the mathematical foundations of inflation measurement, its historical development and the more recent controversies over which measure to use. These books are more suited to a specialist audience. The importance and influence of inflation measures suggests they deserve to be more widely understood and we feel a relatively short, largely non-technical book will contribute to achieving this.

The history of inflation measurement and the uses of inflation measures are themes that run through most chapters. Inflation measures have a long history of development in response to pressing needs. Alongside technical and practical considerations, politics is also part of the story. We dedicate a chapter to a concise description of the development of inflation measurement over a period of around four hundred years. This long view of the development is supplemented by a more detailed chapter describing the recent history. These two chapters explore the development of the conceptual understanding, the practice, the usage and the resulting political implications.

Why is an understanding of the history important? The short answer is that it helps us to appreciate current practice and how the extraordinary extent of the work carried out in the past has advanced and refined the way price change is measured today. Our challenge has been to include as much explanation as possible without getting held up by interesting but obscure technical details.

There are other books on inflation which cover different ground. A recent book on the economic background to inflation and the lessons that should be learned from previous episodes of inflation has been written by Stephen D. King. A political history of economic statistics in America, including inflation, by Thomas Stapleford was published in 2009. We give the details of these books in our section on further reading in appendix C.

Organisation of the book

We start in chapter 1 by reviewing the recent history of rising inflation from the middle of 2021 through to the summer of 2023. Comparisons are made with a longer period: the last sixty years. The effects of inflation are explored; three case studies illustrate the challenges inflation has presented and how governments have responded. In chapter 2, we consider what we mean by inflation, its place in monetary economics and the challenges that need to be addressed in order to quantify it. Having set the scene in the first two chapters, chapter 3 explains how inflation is measured in practice. We identify the data that are needed, how they are collected and how they are used. The important statistical principles are identified.

Our study of the historical development of inflation measurement starts in chapter 4 and covers the long period from the start of the 18th century through to the early 1990s. We describe how the conceptual foundations were established by insightful individuals and early, limited attempts made to find suitable data to produce a measure. The state took over towards the end of the 19th century, and established the first national measure at the beginning of the First World War. We show that there was political interference in inflation measurement between the wars and during the Second World War. A new start was made in the post-war period when what we can call a “modern measure” was first produced. We describe some of the many improvements that were made in the period up to the 1990s.

Chapter 5 continues the history, taking a more detailed look at the highly consequential period from 1992 to 2022. The events in this thirty year period led to inflation measurement being put in a very difficult position with an accompanying loss of credibility for these highly important official statistics. This is the longest chapter in the book and attempts to explain the circumstances in some detail.

In chapter 6, we take a closer look at the data used in the calculation of inflation and investigate what more it can tell us. We show that the changing basket of goods and services can, if used with care, provide an informal view of social change. In chapter 7 we look at the factors that go into producing statistics of sufficiently high quality to meet the needs of users. We also look at public trust in official statistics and how it has changed over time.

Chapter 8 looks beyond the main measures of consumer price statistics to describe other price measures including producer price indices, consumer price indices for special purposes, price statistics for housing, alternative measures and other approaches.

We finish the main text with chapter 9 where we summarise the main themes of the book. Our approach is to pose questions on how we should think about inflation and its measurement and suggest answers. We also consider some likely future developments.

Three appendices follow. The nine chapters of this book avoid equations to make the material as accessible as possible. However, for those with knowledge of mathematics and economics, appendix A presents a concise subset of the relevant formulas and how they are used. A glossary follows in appendix B and suggestions for further reading in appendix C.

Routes through the book

The primary route is, of course, to read all chapters in order. However, for readers with more specific objectives, subsets of chapters will be of particular interest. While individual chapters link together, they still work effectively when standing alone. If the primary interest is in how inflation is currently measured then chapters 3 and 6, with or without appendix A for technical detail would be suitable. If an understanding of the historical development is the main goal then chapters 4 and 5 would suffice. For a view of what inflation is and its importance, then chapters 1, 2, 7 and 8 are recommended. The language of inflation is discussed in chapters 1 and 2; for the two shorter routes through the book, the important terms are also defined in appendix B, the glossary.

ACKNOWLEDGEMENTS

We would like thank our current and former colleagues, both in academia and the wider world of official statistics; much has been gained from discussions with them over many years.

A wide variety of books, research papers, official documents and newspaper articles have been consulted in the writing of the book and we are grateful for the support of the library staff from our respective universities. Thanks also to Cambridge Scholars for their expert handling of the manuscript.

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ABBREVIATIONS

COICOP	Classification of Individual Consumption by Purpose
CPAC	Consumer Prices Advisory Committee
CPI	Consumer Prices Index
CPIH	Consumer Prices Index including owner occupiers' housing
CPIY	Consumer Prices Index excluding indirect taxes
CPI-CT	Consumer Prices Index at Constant Taxes
EU	European Union
HCI	Household Costs Index
HICBC	High Income Child Benefit Charge
HICP	Harmonised Index of Consumer Prices
HPI	House Price Index
IFS	Institute for Fiscal Studies
IMF	International Monetary Fund
IPHRP	Index of Private Housing Rental Prices
ISO	International Standards Organisation
GDP	Gross Domestic Product
GSBPM	Generic Statistical Business Process Model
ONS	Office for National Statistics
OSR	Office for Statistics Regulation
LCF(S)	Living Costs and Food (Survey)
MP	Member of Parliament (UK)
NHS	National Health Service
NHSPRB	National Health Service Pay Review Body
PDCA	Plan, Do, Check, Act
PPI	Producer Price Index
RPI	Retail Prices Index
RPIJ	Retail Prices Index Jevons
RPIX	Retail Prices Index excluding mortgage interest payments
RPIY	Retail Prices Index excluding mortgage interest payments and indirect taxes
SPPI	Services Producer Price Index

UK	United Kingdom
UKHPI	United Kingdom House Price Index
UN	United Nations
VOA	Valuation Office Agency

1 A TIME OF RISING PRICES

The period from the summer of 2021 to the end of 2022 saw the economic news in the UK dominated by the rate at which prices were rising. Between August 2021 and August 2022, households faced gas and electricity prices rises of 54% and 96% respectively[1]. Food prices increased 14%, with milk, cheese and eggs rising by 22% over the same period (ONS, 2023a). The drivers for these price rises included the recovery from the covid-19 pandemic and the war in Ukraine (BBC, 2023).

With prices rising at rates not seen for 40 years, many families struggled to cope, despite cutting their spending. As the Bank of England raised interest rates in an attempt to control inflation, so mortgage rates increased, adding further pressure on those homeowners who don't own their own homes outright. Those renting saw rents rise as some landlords passed on higher costs. The media have an expression for times like these … the country was facing a "cost of living crisis".

Businesses were also affected by the rise in prices for the energy, fuel and raw materials they use. When energy costs rise, the effects on businesses feed into price rises for products in the consumer marketplace. In some cases businesses saw inflation affect both the costs they face and the demand for their products. Sharply rising prices had implications for the labour market too. Workers went on strike as pay offers from employers fell short of the levels required to match the rise in prices.

In this chapter, we look at the effects of changing prices and introduce some of the relevant economic concepts, including the general level of prices, the rate of inflation and the value of money. We look at three examples of how governments have approached adjusting benefits, pensions and wages in response to rising prices. In chapter 2 we look in

[1] These figures are averages across households; some households were on variable price arrangements and others on fixed rate tariffs.

more detail at the language of prices and inflation and the challenges that need to be addressed to move towards producing a measure which is useful and reliable. The actual practice of measuring the general level of prices in the UK is described in chapter 3.

1.1 Price rises in context

How did price rises between 2021 and 2023 compare with price behaviour in recent years, say back to 2010? Figure 1.1 shows the levels of average domestic prices of electricity, gas and some food items from January 2010 to August 2023, where the average prices have been set to be 100 in 2015 for all three items so that we can more easily identify the trends.

For electricity and gas, prices rose in March 2021 as the world's economies emerged from covid-19 lockdowns, with demand exceeding supply. In addition, the response to the war in Ukraine had consequential effects, with Russia restricting the supply of gas. The stepped nature of the change in energy prices reflects the operation of energy price caps which effectively store up price changes, with consumers seeing prices updated only periodically as the price cap was increased (UK Parliament 2022).

The price rises in energy were so extreme that many households were unable to cope. The UK government intervened to limit the effects of these dramatic rises in price with a range of measures including: limits on prices for electricity and gas, rebates on energy bills, cost of living payments for pensioner households and those in receipt of benefits and the freezing of duties (UK Government 2022). For food producers, the increase in energy costs together with higher costs for inputs such as animal feed resulted in increases in the price of food items for retailers and then consumers. Although food price rises weren't as dramatic as those for electricity and gas they also contributed to the pressure on family budgets.

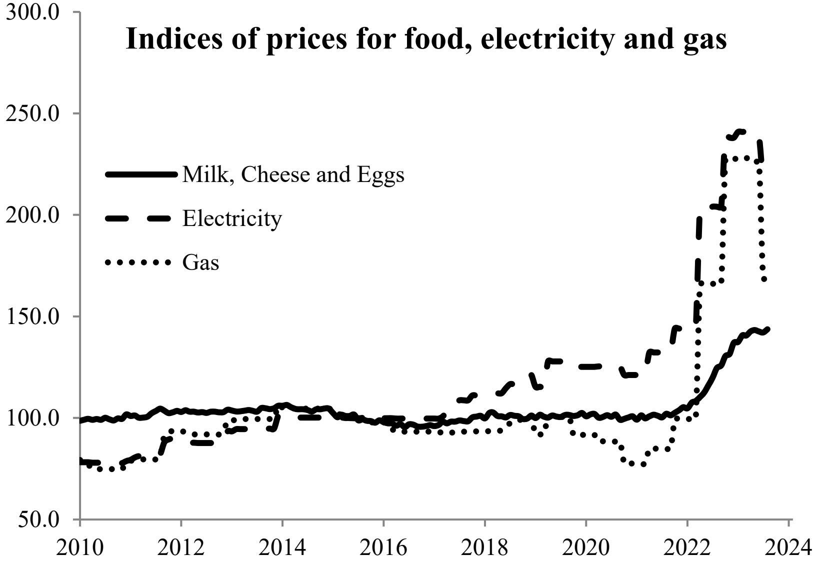

Figure 1.1: Indices of average domestic prices of selected items, January 2010 to August 2023 (2015=100). Data source: Office for National Statistics 2023a, series D7D8, D7DT, D7DU.

1.2 Overall price change and inflation

If we look at Figure 1.1 and focus on the period from the June 2015 to June 2017 we see little change in average prices; from March 2017, the price of electricity starts to rise but the price of milk, cheese and eggs shows little change and the price of gas shows a very slight fall. In periods outside of major global economic events, most prices change little over time with some items rising a little in price and some falling. If we consider all of the items in the consumer marketplace, most people would say that, in their experience, prices tend to rise more than fall, so that over a long period, say a decade, a significant rise in prices will be seen. While we might notice price changes in items that we buy regularly, it is much less easy to recognise price changes for irregular purchases such as furniture or computers. With a consumer marketplace consisting of millions of items, no individual, however much they like to shop, can form a balanced judgement of how prices are changing overall. Is the perception that prices rise overall correct?

It is not just the sheer number of items in the consumer marketplace that complicates judging the overall movements of prices. The marketplace is dynamic, with new products appearing while others disappear. Individual consumers have their own preferences resulting in differences in purchasing choices and these consumer preferences change over time. An example of change in the marketplace is the rapid improvement of camera functionality in smartphones; this has put pressure on the demand for entry level digital cameras. To make sense of this complex picture of consumer preferences and market changes we have to turn to official statistics.

Consumer price statistics take a view across the whole of the consumer marketplace and account for the preferences of the whole purchasing population. By using statistical methods, measures of an overall level of prices, a type of average of prices, can be estimated. Such measures are known formally as the **general level of prices**, or sometimes just the **level of prices**. Official estimates are produced every month, so we can track whether overall prices are rising or falling. There are several official measures currently in use; for now, we will just look at the Consumer Prices Index (CPI), which is the main measure used by the government to track price change. An actual average of prices isn't useful; what is important is the change in prices[2]. A **price index** quantifies an overall measure of prices relative to a reference period. To make the degree of change easy to see, the Consumer Prices Index has been set to be 100 in the year 2015; figure 1.2 shows how the CPI has changed since over the period from January 2010 to August 2023.

We can see in figure 1.2 that the trend of the general level of prices over this period, as measured by the Consumer Prices Index, was almost always

[2] An average over prices of a range of different items isn't usually very informative. However, when we are considering the price of one type of item, such as property, it is can be useful. With the fascination with house prices (at least in the UK), there is broad public interest in the average house price and averages for different property types and regions of the UK.

upward, which won't be a surprise to most people. We can also see a sharper rate of increase from March 2021.

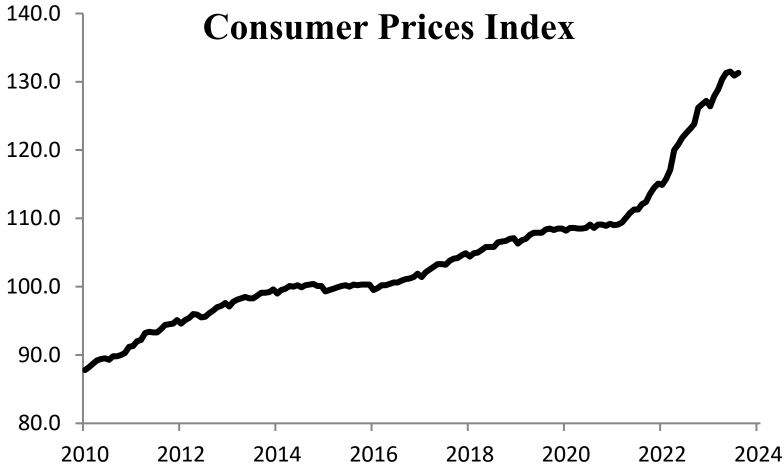

Figure 1.2: The level of prices as measured by the Consumer Prices Index (CPI), January 2010 to August 2023 (2015=100). Data source: Office for National Statistics 2023a.

As overall prices rise, so a fixed sum of money will buy less and less, a phenomenon that economists refer to as the diminishing purchasing power of money. This tells us something important: the value of money changes over time.

Measures of the general level of prices are calculated by the Office for National Statistics each month. However, it is not the general level of prices that is reported widely but the percentage change over a 12-month period; this is called the (12-month) **rate of inflation**, or just **inflation**. A typical news report will say: inflation, as measured by the Consumer Prices Index (CPI), reached 11.1% in October[3], the highest value for over 40 years. How has the rate of inflation changed over time? Figure 1.3 shows the rate of inflation, as measured by the CPI, between January 2010 and August 2023.

[3] This was the value of 12-month change in the CPI in October 2022

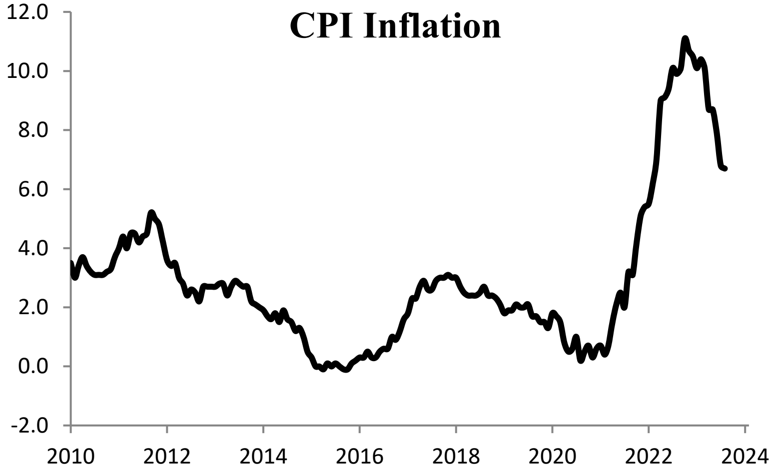

Figure 1.3: The Consumer Prices Index (CPI) rate of inflation (12-month), January 2010 to August 2023. Data source: Office for National Statistics 2023a.

Inflation tells us the rate at which prices are changing. Over the period from January 2010 to December 2020, the average value of inflation as measured by the Consumer Prices Index was 2.1%[4]. In March 2021 inflation stood at 0.7% but by October 2022 it had reached 11.1%, a rapid increase over a relatively short period. Note that even when inflation had fallen to 6.7% in August 2023, it still meant that prices overall were rising. There are times when the general level of prices falls and inflation is negative, but they are rare. Between January 2010 and August 2023, inflation was negative for only three months out of 164 and then by only 0.1% on each occasion.

There is a very important aspect of inflation that sometimes confuses people. When inflation is falling, as it was between October 2022 and August 2023 (apart from a 0.3% rise in January), prices are still rising, but just at a lower rate. It is understandable that falling inflation is a cause for celebration but it's not as welcome as stable prices.

[4] Economists are usually comfortable with this slow and steady growth in prices as it allows for the reorganisation of relative prices, a practice that is considered positive for the economy.

1.3 Inflation and its effects on households

It is not difficult to see how an inflation rate of 10% would be harmful for households. For those on a fixed, relatively low income, sharp rises in the prices of essential items such as heating and food might require them to cut back on one or the other (or both). Some households will be able to manage by adjusting their spending but others will be pushed beyond the point at which they can cover all of their necessary expenses. If a household has a fixed income, then as prices rise, so less and less can be bought with the same sum of money. The effects of inflation are particularly stark when inflation is at high levels, but it has also has a damaging effect when inflation is at lower levels. The example below demonstrates this.

Imagine you have an annual income of £29,500, which was the median annual pay for Great Britain in June 2022, before tax and other deductions, excluding bonuses, rounded to the nearest hundred pounds (ONS 2022). Let's say you spend £26,000 a year and save £3,500. Assume also that your income remains unchanged over the following years. If your purchases taken together move with a rate of inflation of 2% per year, then over a period of 10 years your spending would need to increase to around £31,700 to purchase the same items. Your spending would match your fixed income in year 7; you would no longer be able to save anything. Beyond that point, you would need to cut back on what you buy as well. Now consider the same scenario but with inflation at 5%. After 10 years, your equivalent spending would need to rise to £42,351. In this scenario, your expenditure would match your income in year 3.

There is an alternative way of representing this. We can say that as prices rise, the purchasing power of our fixed income declines. Our income of £29,500 is fixed as a sum of money; after 10 years with annual inflation at 2% its purchasing power would fall to £24,200 in today's money. If annual inflation was 5% then after 10 years the purchasing power of our income would be around £18,100 in today's money. No-one would want to see their income decline from £29,500 to £18,100 over ten years. The effects of inflation are damaging.

Is an inflation figure of 5% or more lasting over a period of ten years or so realistic? We don't have to go back very far in UK economic history to find a long period of high inflation. The 1970s and early 1980s are often used as the classic example of high inflation in the UK. For the period from January 1974 to December 1981, the rate of inflation was above 10% for 81 out of 96 months with an average value of 15.6%. Inflation peaked at 26.9% in August 1975. Figure 1.4 shows inflation for the period 1965 to 2023, based on the Retail Prices Index, which was the official measure for most of the period[5].

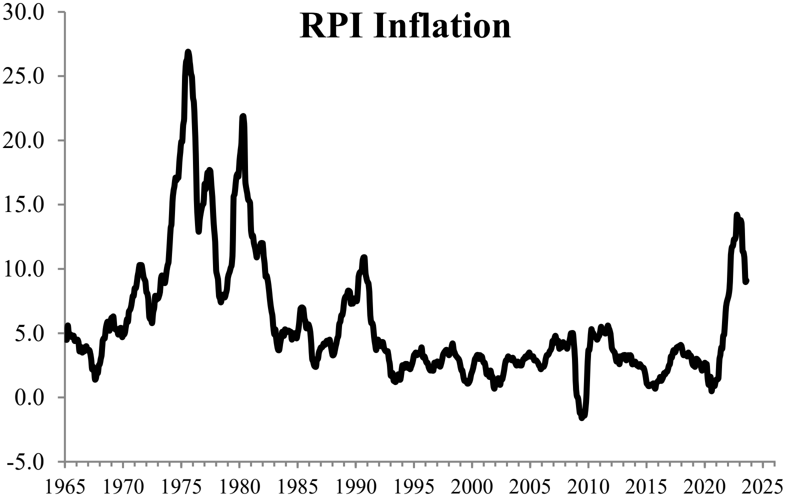

Figure 1.4: The Retail Prices Index (RPI) rate of inflation (12-month) January 1965 to August 2023. Data source: Office for National Statistics 2023a.

If we look beyond the UK, it is less rare for countries to experience sustained high rates of inflation; for example, Ghana has only had a single year with inflation less than 5% since 1970 (World Bank n.d.).

Is there a positive side to inflation? Just as fixed incomes (in money terms) reduce in value as the level of prices rise, so do debts. An individual or couple buying a property with a mortgage would see the size of their

[5] We explain the difference between the CPI and the RPI in chapter 5.

borrowing reduce, as a multiple of salary borrowed, if income was increased in line with inflation.

1.4 Can we avoid inflation?

From a household point of view, it would be helpful if inflation was at or near zero. However, in a globalised world, prices can be affected by distant events beyond the control of the UK government, so some rises are inevitable. A number of countries task their central banks with keeping inflation at low levels; in the UK, the target value is 2% (as measured by CPI inflation) and the Bank of England has the responsibility to keep inflation at or around this level. If inflation deviates from the target level by more than a set amount, the central bank will intervene, usually by raising (or lowering) interest rates. This approach is not a precise science and there is invariably a lag between interventions and their effects on inflation. Why is the target for the Bank of England (and the central banks of other countries) 2% and not zero? Annual inflation of around 2% is considered healthy for the economy as we will discuss in the next chapter.

We can conclude that UK households can at best expect relatively low values of inflation for most of the time with occasional periods of higher inflation; the impact of the latter being far more dramatic than the former. The result will be a reduction in the value of money over time and households will be at risk of damaging consequences.

The fall in the value of money due to price rises is an issue that was recognised a long time ago. An appreciation of the concept of the value of money changing over time was recognised at the start of the 18th century. By the early decades of the 19th century, the problems caused by gradual price increases were described clearly, together with an outline of the way to estimate overall price change and what this information could be used for. It was proposed that wage rates should be adjusted by a measure of the level of prices to compensate for the falling value of money. We will see that it took a long time for a practical, national measure of the general level of prices to be produced. It wasn't until 1914 that such a measure appeared. It was used to inform changes to wage rates for essential workers during the First World War; its use grew rapidly after the war[6].

1.5 Inflation adjustment

Adjusting pay in response to rising prices was the first application of a measure of the level of prices for official purposes. However, in today's world, pay is part of a wider picture. There are other sources of household income, such pensions and benefits. To compensate for rising prices, adjusting these sources of income by an inflation measure is required. A number of other financial quantities such as tax thresholds are specified in money terms and also require adjustment if they are to maintain their value. The costs of providing services which extend over many years are affected by changes in the value of money too; examples include mobile phone contracts and regulated rail fares. To preserve financial values, a whole range of incomes, thresholds and costs need regular updates. The adjustment of financial amounts in line with the growth in an index is called **indexation**. The growth in the general level of prices, or inflation, is the most commonly used indicator for indexation, but growth in average wages is also sometimes applied. Adjusting financial amounts in line with inflation is sometimes known as **uprating** (Masala 2022). In this book we use the term "indexation" to mean adjustment by inflation; we use "wage indexation" when adjustment is made by a measure of the growth in average wages.

In principle, indexation can be applied by employers and providers of private pensions each year. The government can adjust public sector pay and pensions, the state pension, benefits and thresholds. What happens in practice? Isn't it tempting to either under-index, that is, to adjust less than an inflation measure suggests, or not index at all? When inflation is at relatively low levels, like 2%, inflation adjustments can usually be made without serious implications for the government or for most employers. For higher values of inflation, the position is not straightforward as we will see in the following sections.

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[6] We explore the early history of inflation measurement in chapter 4.

Earlier in the chapter we examined the changes in the price of electricity, gas and some foods; we saw that the degree of price change is not the same across commodities. The official figures estimate inflation for all goods and services that are bought by households. Depending on the actual items that households buy, they may find their monthly expenditure rises higher than the overall inflation figure suggests. If their income, through wages, benefits and pensions is adjusted by the official rate of inflation, they may still end up paying more for what they buy, though it's also possible they might spend less. Although inflation adjustment is highly beneficial, it is not expected to compensate all households for all possible combinations of goods and services they buy. In addition there is a concern that simply increasing people's wages in this manner will fuel a secondary inflation effect and cause a potential inflation spiral. This risk was raised during the discussions on suitable pay rises in 2022 and 2023; it is an issue hotly debated in economics.

When inflation rates reach high levels, such as occurred in 2022 and 2023, employers and the government are usually reluctant to match adjustments to inflation. This leads to disputes and industrial action. Employers including the government stress that pay rises have to be "affordable"; for employees it is understandable that they don't want their incomes to fall in real terms. For the government, it is a balance between protecting the public, especially those on low incomes, against protecting the state of public finances. It is a contention that is ever present in budget documents, manifestos, parliamentary debates and parliamentary inquiries.

1.6 Responding to inflation in practice

An important function of official statistics is to enable the public to judge the performance of the government. With inflation statistics readily available, we can use them to explore whether pay, benefits and pensions are keeping up with overall price change. If we collect data year by year, we can plot graphs of the actual sums of money received each year through wages, benefits or pensions. However, whenever we want to study the variation of financial quantities over periods of time, care is needed. There are two ways of proceeding. Where data series include the effect of the change in the value of money we say we are representing the variation in **money** or **nominal** terms. If we want to see the change over time without the change in the value of money, we can use a measure of the level of prices to remove it and redraw our graphs. We call this the variation in **real** terms[7].

For state benefits and pensions, inflation adjustments are usually made but the picture is mixed. There is a statutory requirement to increase some benefits by at least the rate of inflation while others rely on the discretion of the relevant minister. For example, benefits administered by the Department for Work and Pensions include Disability Benefits (Disability Living Allowance, Attendance Allowance and Personal Independence Payment), Carer's Allowance and Incapacity Allowance which have statutory indexation while Universal Credit does not. Child benefit, administered by HM Revenue and Customs, is also indexed at the discretion of ministers (Kirk-Wade et al., 2022). When negotiating pay, the level of inflation is taken into account by both employers and employee representatives. Employers are often keen to make pay offers conditional on the workforce accepting revisions to working practices to improve productivity.

Where indexation is under the control of government, which is the case for benefits, public sector pay and pensions, the state pension and also for thresholds including those for direct taxes and duties, there is inevitably a degree of political judgement involved. In periods of recession, or more generally when public expenditure is considered to be too high, ministers may freeze payments by not applying inflation adjustments, so reducing the value of the benefit, pay or pension in real terms. While this reduces household incomes it strengthens public finances, again in real terms.

A student of HM Treasury budget documents will be very familiar with Chancellors of the Exchequer freezing payments and thresholds, or under-indexing them. It is a major mechanism used by governments to control public expenditure. Why is it so attractive to ministers and used widely? One reason is that it doesn't result in the levels of attention that direct tax rises attract but can be very effective when applied over a number of years.

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[7] Appendix A gives a formula for doing this.