



BANK OF ENGLAND

Speech

Monetary Policy, Data Uncertainty and the Supply-Side: Living With the Statistical Fog

Speech given by

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To the Society of Business Economists at the Chartered Institute of Public Finance and Accountancy in London

15 September 2004

I would like to thank Lavan Mahadeva and Alex Muscatelli for their considerable research support in preparing this speech and for allowing me to draw extensively on their work, Jonathan Marrow for technical support, and Martene Giles and Helen Jay for secretarial assistance. I am grateful to Kate Barker, Charlie Bean, Rebecca Driver, Jenni Greenslade, Neal Hatch, Simon Hayes, Mervyn King, Robin Lynch, Benjamin Martin, Colin Mowl, Edward Nelson, Jumana Salaheen, Sally Srinivasan, Nick Stern, Geoffrey Wood and Tony Yates for helpful comments received on an earlier draft. I am also grateful to Carl Walsh for allowing me to use and show results from his research.

The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

Monetary policy, data uncertainty and the supply-side: living with the statistical fog

“For, tell me, do you think our prisoners could see anything of themselves or their fellows except the shadows thrown by the fire on the wall of the cave opposite them? And would they see anything more of the objects carried along the road? ...Then if they were able to talk to each other would they not assume that the shadows they saw were the real things? ...And if the wall of their prison opposite them reflected sound, don't you think that they would suppose, whenever one of the passers-by on the road spoke, that the voice belonged to the shadow passing before them?

And so in every way they would believe that the shadows of the objects were the whole truth.”¹

In this way, Plato in “The Republic” helps his pupil Glaucon to “picture the enlightenment or ignorance of our human condition”.

Economic statistics are often only an approximation of the underlying reality they are attempting to measure. Like the prisoners in Plato's cave, we risk confusing the shadows we see with the abstract notions of economic theory. And when a change in the light causes the shadows to change we may become angry, suspecting that we have been misled, failing to see that the truth has not changed and that the different image might be a source of knowledge.

This evening, I would like to spend some time looking at the various ways in which data uncertainty might arise, attempting to evaluate the extent of our ignorance, before moving on to discuss how the monetary policy maker might discern developments in inflationary pressure in the face of such uncertainty. In particular I shall examine uncertainty over how the measured money value of spending and output in an economy is allocated between prices and volumes; and how that could affect the relative weight a policymaker might choose to place on measures of growth in the money value or in the volume of national output, and on the level of output and the output gap.

¹ Plato, The Republic (translated by Desmond Lee), Penguin Classics.

Conceptual discrepancy

Much recent interest has been over data measurement issues and revisions policies. And I intend to devote some time to these issues this evening. But first we should recognise that this is not the only source of data related uncertainty. Even when data can be perfectly measured, there is often a discrepancy between the economic concept that we would like to measure and the real world phenomenon that the statistics attempt to measure.

Take money data for example; in my view some of the most timely and accurate data available – largely directly measured, so suffering little from sampling problems, rather less vulnerable to late returns than many other series, and yet a pot-pourri of financial balances held in an arbitrarily defined set of financial institutions for a multitude of reasons, for transactions, savings, a store of value, a buffer stock.

Or the claimant count: again, precisely defined and directly measured. But how important is it as a measure of unemployment, or the tightness of the labour market?

Both the Retail Price and the Consumer Price Indices are measured from information on the prices of a defined basket of goods and services collected on a particular day each month, weighted together in a particular way. There are some differences in methodology between the two series, and yet both measure the same underlying concept – consumer price inflation. Moving from one measure to another does not mean *by itself* that our view of the underlying concept has changed, but it does mean that we need to understand how each measure is put together.

So, before we even begin to think about how accurately data are measured, we need to give some thought to what it is we are seeking to measure, and how accurately can the data, no matter how well measured, capture the underlying concept.

A measure of consumption that we can relate to theories of how consumers behave would be consumer spending on non-durable goods and services plus the flow of services enjoyed from durable goods. But this latter component is not observable. So in practice what the statisticians try to measure is household expenditure on durable goods, as well as on services and non-durable goods. And no matter how well they

succeed in accurately measuring household spending, there will still be a difference between that and what we would wish to measure.

The Monetary Policy Committee has recently spent some time looking at measures of government activity. We are not alone in this, so has Sir Tony Atkinson who is presently investigating how to improve the measurement of government services. What has become very clear in this work has been the importance in identifying what it is we are trying to measure. For the MPC, the interest has been in identifying the inflationary pressure generated by government activity. That depends on the resources absorbed by the public sector and how that affects the ability of the market sector of the economy to meet the demand for its goods and services. Sir Tony Atkinson's review concentrates on measuring the volume of government output within the context of the national accounts, recognising their dual function as a measure both of economic activity and of welfare. And, as his Interim Review says, any change to "the direct measure of government output should not affect the macro-economic policy stance."²

Measurement uncertainty and revisions

Not all economic series can be directly measured. Many more must be estimated. Gross Domestic Product seeks to measure the total economic activity, the value added, that takes place within the United Kingdom. It would be a gargantuan task to measure this directly, to attempt to track every economic transaction, and would impose an intolerable administrative burden on businesses and consumers. Much of the data that we commonly use therefore have to be estimated from surveys. This gives rise to measurement issues stemming from problems of coverage, sampling and non-response.

Official statistics can thus be subject to significant uncertainty, especially in timely first releases. Revisions then inevitably arise from new information that improve the accuracy of the data— a late return perhaps, or a more in depth survey carried out with less frequency. Some may arise from methodological improvements such as the revisions to the measurement of the output of the National Health Service, or the move to annual chain linking.

² Atkinson (2004).

Data quality and monetary policy

The Monetary Policy Committee recognises that revisions are inevitable. Indeed, in so far as they bring us to a better understanding of the underlying reality, we welcome them. And it is incumbent on us, collectively and individually, to try and make the best decision possible each month in the light of the information available to us at the time and our interpretation of it.

In doing so we recognise that much of the data with which we work is imperfect and subject to revision. We recognise that data quality varies within the release cycle, that the preliminary estimate may be different to the final release, and that some series are more reliable than others. It is the job of all users of economic statistics to recognise and deal with this. There is inevitably a trade-off between timeliness and accuracy, but in general, aware of the shortcomings, we would prefer early imperfect data to late perfect series – it gives us something to work with.

At the Bank³ data quality is typically assessed in terms of its:

Relevance – how closely does it accord with the underlying concept we want to measure for the purpose of inflation targeting;

Accuracy – how well is it measured and how much is it revised;

Timeliness – is it released within a timescale that makes it useful for policy purposes;

Coherence – how well does it relate to other pieces of data, over time and across the economy.

We are aware of the scope for revision to many data series and we are continuously developing models that help us assess how much weight to place on a particular observation of data at any point in time.

Price-volume uncertainty

A particular difficulty can be in allocating movements in nominal variables to price and volume changes. This matters for monetary policy; not just because monetary policy is concerned with the price level and its rate of change, but because the policymaker aims to achieve a stable inflation rate by ensuring that the volume of demand for an economy's output grows in line with its potential to supply. And it is

³ The criteria used draw on the work of Brackstone (1999).

on this source of data uncertainty and its policy implications that I'd like to concentrate this evening.

Conceptually it seems fairly clear. In practice it is fraught with difficulty. If one buys a car one year for £10,000 but a similar model costs £11,000 a year later it might seem straightforward. The price has risen by 10%. But what if the car now has air conditioning, and a cd player comes as standard? Suppose crash test statistics suggest it has a better safety performance? How do we then allocate the change in the cost of the car between quantity and price?⁴

A further complication arises when we are considering not just the output of one good, or the expenditure on one good, but the production or consumption of a basket of goods and services. How should the components of total output or total expenditure be weighted together?⁵

In general, national accounts statistics are compiled by bringing together data on values and prices from surveys. Typically, these will be surveys covering, for example, firms' turnover, expenditure, income and profits, consumers' expenditure, income, etc. To calculate the aggregate real volume change, data from the various production sectors of the economy are weighted together, with the weights for each sector typically determined by the current price value share of that sector in whole-economy output in a base year. Direct volume measures are available for few series. Similarly, data for the various expenditure aggregates are weighted together according to the share of that category of expenditure in total expenditure, defined in terms of current value, in the base year.

Periods when value shares change notably from the base period, reflecting changing economic structures and relative prices, are therefore periods of high data uncertainty or "mismeasurement".

⁴ One way statistical agencies deal with quality change is by the use of "hedonic regressions" recommended by the Price Statistics Review Committee (US) way back in 1961. The idea is that the characteristics of the goods rather than the goods themselves are the true components of the utility function (outputs of the production function) and that heterogeneous goods are an aggregation of characteristics. Hedonic regression relates the price of these goods to data on the characteristics themselves (such as processing speed in computers, or the number of rooms in houses).

⁵ See Tuke and Reed (2001) and Lynch (1996) for a description of alternative methodologies.

The exact nature of this “mismeasurement” depends on the source of these relative movements and the price elasticities of the goods. The most well known case is that of “substitution bias” with fixed-weight indices. Substitution bias arises if goods the relative prices of which are falling are also those the volumes of which are rising, but such that their value share is decreasing. In that case a fixed-weight index, which failed to update weights as relative prices changed, would overstate volume growth and understate inflation.

Revisions to data

Like most economic statistics, national accounts data are revised regularly, with revisions taking into account both new information and new methodologies. Regular rebasing ensures that changes in industry structures and/or relative prices are taken into account in the production of aggregate data. Through the introduction of methodological changes such as more frequent rebasing and chain-linking statistical offices are, in a sense, responding to price-volume uncertainty error by periodically bringing in new information on relative prices, and on the relative importance of each sector of the economy.

Until last year, the ONS rebased the national accounts every five years. Last September, annual chain-linking of real GDP data was introduced. Real GDP growth in each year (up to 2001) was calculated on the basis of weights measured as the current price share of total activity in the previous year. The main rationale behind the introduction of annual chain-linking was that annual rebasing would give a more accurate picture of the weight of each sector in the economy.

Here we look at vintages of quarterly real and nominal GDP data going back to 1989Q3⁶. We have made no attempt to separate the different types of revisions across these vintages, nor to isolate revisions to the price-volume split.⁷ Chart 1 plots the cumulative revisions in growth rates, where the cumulative revision is defined as the

⁶ Ellis and Castle (2002) discuss the construction of a database that contains successive releases of data for the expenditure measure of real GDP and its components.

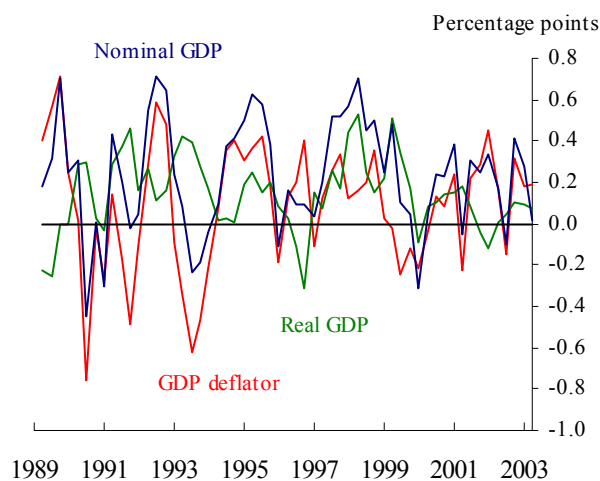
⁷ Akritidis (2003) provides an analysis of revisions to real GDP growth estimates in the UK, showing that a substantial part of revisions to initial estimates of real GDP growth is due to revisions to the data following the second Blue Book, i.e. the second time the estimate of GDP has appeared in a Blue Book. GDP data at this stage are subject to balancing in the Supply and Use input-output balancing framework for the second time or more. We checked to see if correlations changed when we restricted ourselves to data that had been through at least two Blue Books (up to 2001 Q4) and found that the correlation between quarterly GDP deflator inflation revisions and quarterly GDP growth revisions became only slightly more negative.

percentage point difference between the initial release of data and the latest vintage (the release of June 30th 2004 in this case). Table 1 summarises the statistics on the revisions.

Table 1. Summary statistics on cumulative revisions to quarterly growth rates of GDP data (1989Q3-2004Q1 vintages, 59 observations)

	Mean revision	Mean absolute revision	Standard deviation
Nominal GDP (quarterly growth)*	0.24	0.54	0.67
Real GDP (quarterly growth) (a)*	0.13	0.27	0.35
GDP deflator (quarterly growth) (b)*	0.11	0.54	0.70
Correlation between (a) and (b)		-0.35	
*Percentage points			

Chart 1. Cumulative revisions to quarterly growth rates



Note: Centred three-quarter moving average

Some patterns stand out. First, quarterly real GDP growth and GDP deflator inflation have both been revised up on average over this period, and by roughly the same amount as measured by arithmetic mean revisions (column 1). The mean absolute revision in the second column measures the absolute size of these revisions without taking account of whether they were positive or negative. This absolute measure shows that quarterly deflator inflation rates have been revised by more on average than have real growth rates. And the third column shows that deflator inflation revisions are more volatile, as shown by a larger standard deviation, so that it is more difficult to predict them than it is real growth revisions. Revisions to nominal GDP growth are on average larger and slightly more variable than those to real GDP growth.

Taken together, this pattern of revisions might suggest that new information on nominal values and prices play a significant role in data revisions. But most interesting for us is to note that the revisions to prices and volumes have been, to some extent, offsetting – the correlation between cumulative revisions to the deflator

inflation and real growth across quarters is minus 0.35 – at least for this period. This is consistent with the presence of price-volume measurement error in early releases⁸.

Price-volume uncertainty in early releases was also apparent in the revisions contained in the 2003 Blue Book, which brought in annual chain-linking accompanied by perhaps the most significant set of data revisions for some time. The real annual GDP growth rate between 1995 and 2001 was revised up by 0.2 percentage points on average. The average revision to annual growth of nominal GDP over the same period was zero. This was mainly due to significant upward revisions in real growth and downward revisions in the annual GDP deflator inflation rate in the 1999-2000 period.

In terms of components, the revisions to real GDP growth in the 2003 Blue Book primarily reflected revisions to imports and investment. Charts 2 and 3 show how the revisions to investment left the level of nominal investment broadly unchanged, but shifted up the level of real investment considerably. The revisions to investment growth primarily reflect a rebasing of producer prices to 2000 (previously 1995). The rebasing led to downward revisions to investment deflators, and hence upward revisions to volume growth reflecting a greater weight given to those goods such as computers which had experienced rapidly falling prices and rising volumes.⁹

⁸ See also Maitland-Smith (2004).

⁹ Because chain-linking is not done at the very lowest level of aggregation, rebasing of this type can affect volumes growth. As the producer price data will not be rebased in the near future, the investment data will remain vulnerable to this sort of measurement issue, if relative prices continue to move significantly.

Chart 2. Real whole economy investment, before and after BB 2003

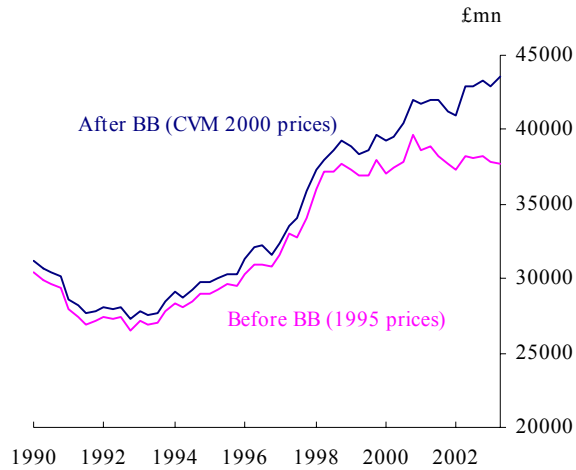
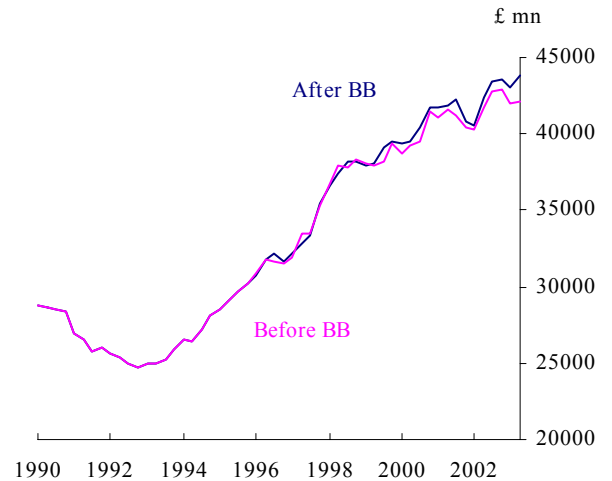


Chart 3. Nominal whole economy investment, before and after BB 2003



More frequent rebasing brings in more information and makes the measurement of real growth rates more accurate. However the level of real output is not comparable across time periods when weights change. A levels series is therefore created by chain linking growth rates across base periods.

Not surprisingly therefore, Table 2 shows that cumulative revisions to the level of GDP are on average higher, though rather less variable around the mean, than revisions to growth rates.

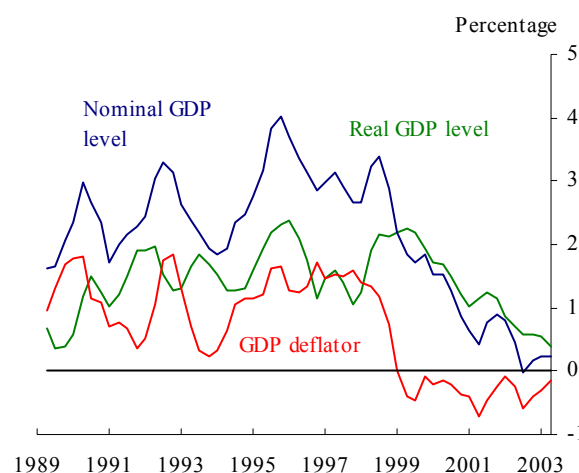
Table 2. Summary statistics on cumulative revisions to real GDP data (1989Q3-2004Q1 vintages)

	Mean revision	Mean absolute revision	Standard deviation
Real GDP (level)*	1.39	0.56	0.68
Real GDP (quarterly growth)**	0.13	0.27	0.35

*% of first release of data

** Percentage points

Chart 4. Cumulative revisions to levels



Note: Centred three-quarter moving average

Of course, levels data on anything are rarely informative by themselves, but must be understood in relation to something else, such as its own value in the previous period or another variable: GDP in relation to population; debt in relation to assets, and so on. Later we shall look at the level of output in relation to potential, or the output gap.

Monetary policy implications of price-volume uncertainty

How does the presence of price-volume data uncertainty affect the weight a policy maker should place on different kinds of information when setting interest rates? And if relationships established in old vintages of data stand to be revised, when does this have implications for a monetary policymaker's view of the future inflationary pressure?

Here I will focus on two dimensions. First, how much information is there in nominal GDP growth data compared to real GDP growth data. Second, how much weight should a policymaker place on growth as against levels data and estimates of the output gap that are derived from levels data.

Nominal versus real data

One response to price-volume uncertainty could be that at times when relative prices change significantly, and trying to assess the split between real activity and a price index is difficult, looking at a money value measure of activity may be informative.

As the Governor said last year¹⁰ “...it is easier to measure the money value of spending and output in the economy than to split it into estimates of "real" output, on the one hand, and price indices, on the other. That is why the latest data revisions have altered the picture of real growth over recent years, leaving estimated money spending and output broadly unchanged. In such circumstances it is sensible to focus on money spending. Indeed, the success of the new monetary framework can be seen in the stability not just of retail price inflation but also of the growth rate of domestic demand in money terms.” Charts 5 and 6 below show the greater stability of the growth rates of nominal domestic demand and nominal GDP in recent years.

Chart 5: Nominal domestic demand growth

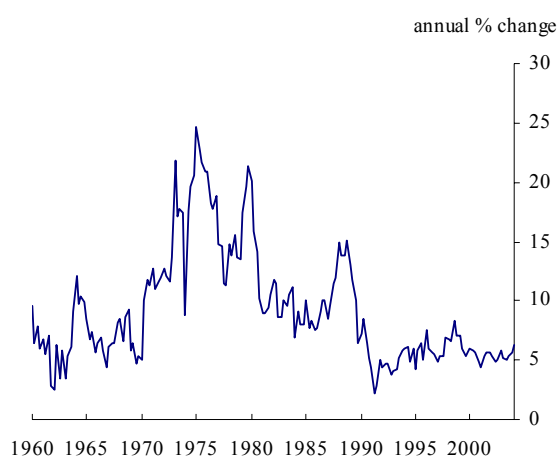
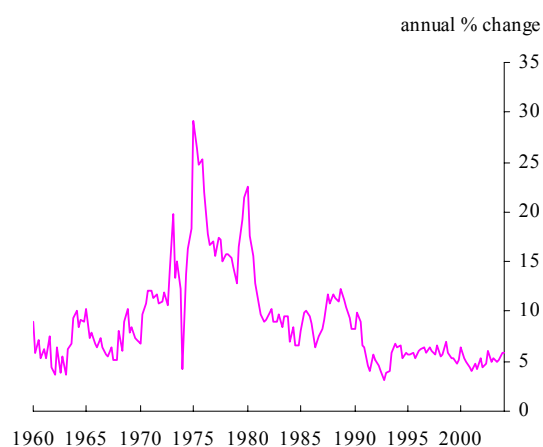


Chart 6: Nominal GDP growth



Here I want to consider the value of nominal GDP data in an inflation targeting regime, where the objective is to keep inflation close to target without excessive volatility in real output. It should be stressed that I am not talking about a nominal GDP targeting framework here. That is beyond the scope of this evening’s talk. Here I will consider nominal GDP data as but one in a set of indicators that jointly help understand the development of domestic inflationary pressure as captured by the true, unobserved output gap. In particular I assume that reliable inflation data on the target

¹⁰ King (2003).

measure is also available. So the issue is really whether nominal GDP growth data can complement real growth data.

A simple way of assessing the worth of nominal GDP growth data against that of real GDP growth data might be to compare how well each would do in estimating the unobservable change in the output gap.

Let us suppose that real GDP growth is mismeasured only because of price-volume mismeasurement. Our assumption that the price-volume mismeasurement error affects real GDP growth data in the opposite direction to the deflator inflation data means that nominal GDP is accurately measured. CPI inflation is also accurately measured, but is assumed to diverge from GDP deflator inflation by an error term.

Equations (1) and (2) below show how each data source is linked to the change in the output gap. For simplicity we assume, for the moment, that true potential output growth is known.

$$\begin{aligned} \text{REAL GDP GROWTH DATA} &= \text{CHANGE IN THE OUTPUT GAP} \\ &+ \text{POTENTIAL OUTPUT GROWTH} + \text{PRICE-VOLUME MISMEASUREMENT} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{NOMINAL GDP GROWTH DATA} &- \text{CPI INFLATION} \\ &= \text{CHANGE IN THE OUTPUT GAP} + \text{POTENTIAL OUTPUT GROWTH} \\ &+ \text{OTHER DEFLATOR MISMEASUREMENT} \end{aligned} \quad (2)$$

Comparing (1) and (2), we can see that there is a trade-off between price-volume mismeasurement and other sources of GDP deflator mismeasurement. If there is greater uncertainty over the price-volume split in nominal GDP than there is over the assessment of GDP deflator inflation, using an independent measure of inflation such as the CPI, then nominal GDP growth data (deflated by CPI inflation) will be relatively more useful in gauging the build-up of inflationary pressure. But if uncertainty over GDP deflator inflation dominates, real growth data may be a better source.

Ongoing work using a structural dynamic model of the transmission mechanism calibrated on UK data suggests that as price-volume data uncertainty increases, monetary policymakers should place greater emphasis on nominal GDP growth data and correspondingly less emphasis on the separate uncertain estimates of prices and volume growth in interest-rate setting. But our calibrations indicate that estimates of real growth can't be entirely disregarded, even when the data are very uncertain.

Interpreting levels revisions

We have seen that there can be large shifts in estimated real GDP levels following revision and re-basing. Should this lead us to alter our view of the inflationary outlook?

Walsh (2003) has used vintages of data for the level of real GDP for the United States to calculate estimates of potential output and output gaps where potential output is estimated using a Hodrick-Prescott filter. His results, reproduced in Chart 7, show that estimates of the level of the output gap are subject to significant revision, by up to 4 per cent of potential output.

Chart 8 applies the same procedure to our UK data from 1989Q3 to 2004Q1¹¹.

Chart 7. Cumulative revisions to output gap estimates (US)

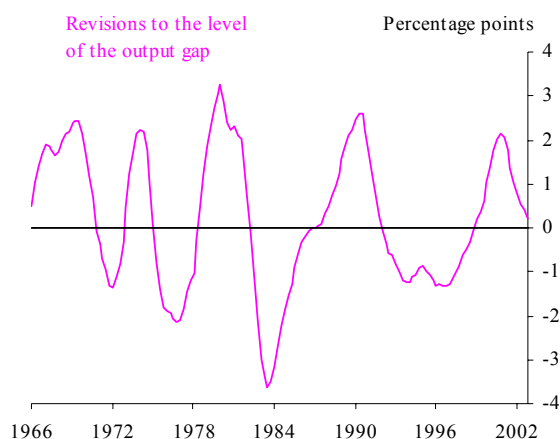
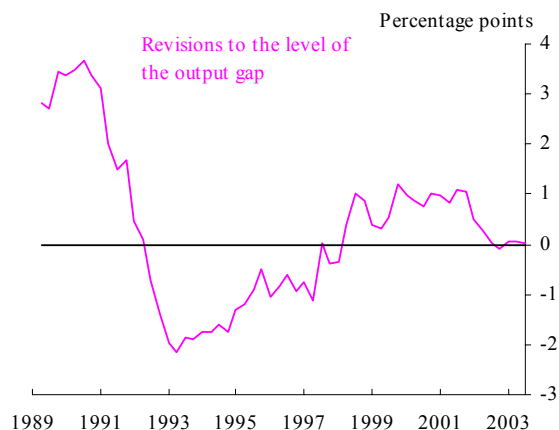


Chart 8. Cumulative revisions to output gap estimates (UK)



Source: Walsh (2003)

¹¹ Although we have real and nominal GDP data from the mid-1950s onwards, which were used in our estimates of potential output, in our dataset *vintages* of data are available only from 1989.

Looking at these charts, we can see that if we were to take these estimates at face value we would judge that data mismeasurement seems to affect the estimate of the level of the output gap much more than it affects estimates of trend growth or real growth. Table 3 compares the revision in the output gap level to the revision in real growth rates, showing that both the mean and the standard deviation is much higher¹². This is of concern since output gap mismeasurement has played a significant role in policy mistakes of the past.¹³

Table 3. Summary statistics on cumulative revisions to UK output gap estimates (1989Q3-2004Q1 vintages)

	Mean revision	Mean absolute revision	Standard deviation
Output gap (level)*	0.31	1.21	1.55
Real GDP (quarterly growth) *	0.13	0.27	0.35

*Percentage points

This analysis might suggest placing less emphasis on output gap estimates, and correspondingly more on growth rate data. The suggestion that for practical data measurement reasons we should place more emphasis on rates of change than levels has some history. For example Federal Reserve Board Governor Edward Gramlich¹⁴ discussed whether, because of measurement error, policymakers should concentrate more on the rate of change of real variables than their levels, within acceptable margins, in judging how much inflationary pressure was building up in the economy.¹⁵

But is this essentially mechanical approach to estimating the output gap sensible? Let us suppose that following a re-basing the level of real GDP is much higher whilst the CPI inflation data remains unchanged. Should our view of the output gap have

¹² The addition of a new observation might result in a re-estimation of trend, even in the absence of other revisions. The Hodrick-Prescott filter used here is particularly susceptible to a change in the end-point, although all methods will suffer to some extent. We have looked at two additional methods of estimating trend output (a simple and a split trend) and find that the standard deviation of revisions to the output gap is little changed. Following Orphanides and Van Norden (2001) we find that a little over half the standard deviation of revisions to the output gap using the Hodrick-Prescott filter is attributable to changing the end-point, the remainder to revisions in the data.

¹³ See Nelson and Nikolov (2002).

¹⁴ Gramlich (1999).

¹⁵ There are separate theoretical arguments for why we should emphasise rates of change above levels. For example the economy might be prone to inflationary bottlenecks whenever it grows too fast.

changed, or might the revisions suggest that the level of potential output is also much higher than previously thought, such that the estimate of the output gap has not changed? In other words, should news in the revision cause us to change our view of the inflation outlook?

There are good reasons to be wary of estimates of output gap uncertainty derived from mechanical approaches. In addition to the variability of GDP levels data, mechanical estimates of the output gap are derived by assuming that potential output is either fixed or is a smoothed trend in real GDP. Hence, by construction, the potential level is unlikely to change as much as the real GDP level. This assumption may be incorrect, indeed it is likely that potential output will vary in response to real changes to, for example, investment, technology, demographics or preferences¹⁶.

Moreover, the mechanical method takes no account of other information such as inflation data, the labour market or surveys of capacity utilisation, all of which the MPC uses to inform its judgement as to the amount of spare capacity in the economy. The mechanical approach also assumes that only aggregate real GDP data is relevant. But disaggregate information on relative price movements might influence our view of supply¹⁷. If we were to allow such additional information, we might find that our best guess of potential output would shift along with our best measure of actual output following a revision. Looking at disaggregate data would also mean acknowledging that rebasing has given us access to potentially relevant new information.

In this respect it may be useful to look at the shifts in relative prices in ONS data and consider what factors might have driven them. We have seen that a change in the price-volume allocation of nominal investment growth was responsible for a large part of the upward revision to GDP growth rates in the 2003 Blue Book. If we look at the main expenditure components of GDP, we can see from chart 9 that the relative price of investment, both whole economy and business, has trended downwards since the early to mid 1980s.

¹⁶ This point is not new. See for example Woodford (2001), Nelson (2002).

¹⁷ See, for example, Whelan (2000, 2001).

Chart 9. Consumption, business investment and gross fixed capital formation deflators relative to the GDP deflator (1966-2003)

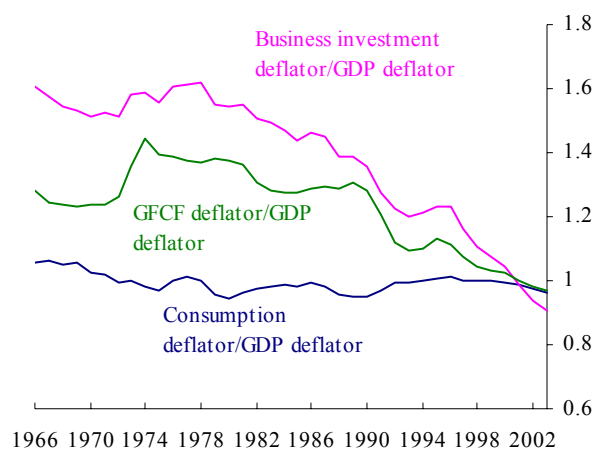
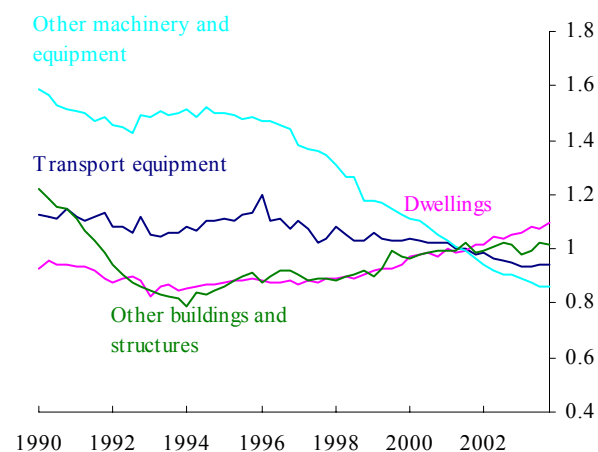


Chart 10. Price of whole economy investment by asset relative to the GDP deflator (1990Q1-2004Q1)



When we look at whole economy investment by asset, in Chart 10, we see that, at least in the 1990s, the fall in relative price of whole economy investment seems to have been driven by “other machinery and equipment”. This includes ICT goods, which probably best illustrate the possibility of trend changes in relative prices¹⁸. As the relative price has fallen, the volumes purchased of these goods have increased.

This could be an example of what economists have referred to as investment-specific technological progress, related to improvements in the efficiency with which we can generate productive equipment capital¹⁹. This would suggest that those goods that have experienced falling relative prices are those that are capital-intensive in their production and distribution.

Consumer durable goods that, once purchased, yield services over time, also tend to be capital-intensive. And although the relative price of consumption as a whole has not changed much over decades, as shown in Chart 9, within the broad categories of household consumption there are substantial differences between consumer durable and non-durable goods. Chart 11 shows that while the relative price of non-durables

¹⁸ See also, for example, Bakhshi, Oulton, and Thompson (2003) and Ellis and Groth (2003).

¹⁹ See Greenwood, Hercowitz, and Krusell (1997).

has been stable and that of services has trended upwards since 1980, the relative price of both durables and semi-durables has fallen since the mid 1990s.

Chart 12 plots the relative prices of the three main components of durable consumption. The downward trend in the relative prices has been due to a sharp decline in the relative price of “recreation and culture” goods, which account for just over 20% of all durable goods, and include such items as audio visual equipment and information processing equipment.²⁰

Chart 11. Prices of categories of households consumption expenditure relative to the GDP deflator (1980Q1-2004Q1)

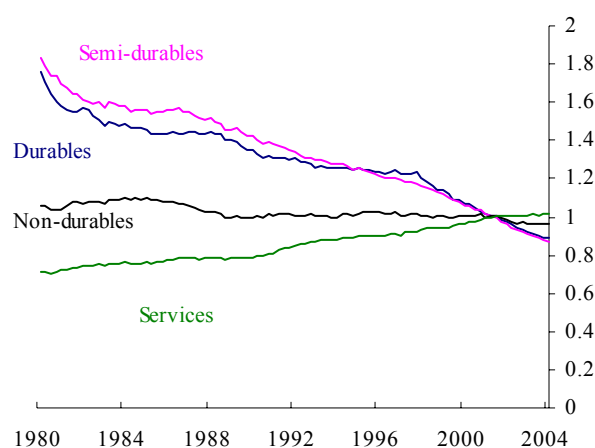
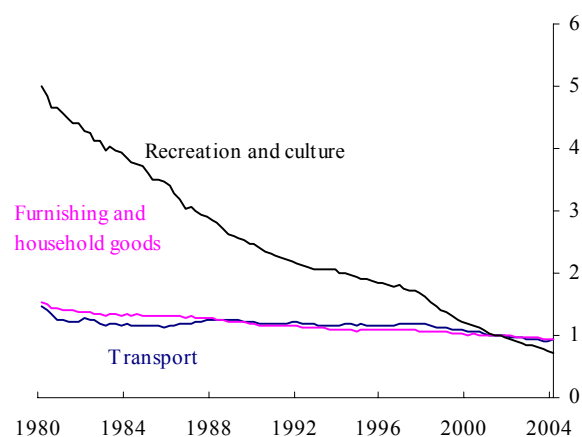


Chart 12. Prices of categories of durables relative to the GDP deflator (1980Q1-2004Q1)



It thus appears that those sectors that have experienced falling relative prices and rising volumes are predominantly those with a higher rate of technical progress. Of course there is an international dimension to this, as many of these goods are purchased from abroad. But it could be consistent with “strong underlying productivity growth that is difficult to discern in the data [...] associated with investment in ICT”²¹. This could be a factor which might have raised the rate of growth of potential output, with implications for our assessment of the output gap.

Conclusion

We can rarely directly observe the economic concepts we might hope to measure. Not only might the concepts not map easily into real world phenomena, but the real

²⁰ See also Power (2004).

²¹ See Bank of England (2004).

world will often not lend itself to direct measurement and will have to be estimated. Such estimates will be subject to revision as more information becomes available. And at times a new methodology might help bridge the gap between the measurable real world and the underlying concept, or enable improved estimation of the real world phenomena.

Revisions to data stemming either from more information or methodological improvements will inevitably lead us to reassess our view of the underlying truth. As the prisoners in Plato's cave found when the Guardian tried to enlighten them, this is not always comfortable. But it is an inevitable part of the policy maker's job, and that of other users of statistics, to make sense of revisions. Improvements to statistics should be something we welcome, not criticise.

I have argued that understanding the nature of data uncertainty and revisions should inform our judgments about the world. In the presence of price–volume uncertainty for example, we may find that measures of nominal values contain useful information, which can supplement the imperfect estimates of real variables. Data on the level of GDP appears more prone to mismeasurement than growth rates, and we should be wary of conventional mechanical estimates of the output gap, which rely heavily on levels information. I argue that we should not ignore other relevant information and the relative price data used in the rebasing process may itself be informative.

We should remember that the true understanding in Plato's cave comes not when the one prisoner is forced blinking into the light and sees the true objects for the first time, but when he goes back in to the cave and comprehends how the interaction of the light, the objects and the wall of the cave produce the shadows, which is all that those who are still captive can see.

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