

Inflation: looking under the hood

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on the occasion of the Bank's Annual General Meeting
in Basel on 26 June 2022

How quickly the world can change. Inflation is back; and how! After so many years of struggling to lift it up to target, central banks are again facing the once painfully familiar challenge of bringing it down.

Despite the urgency of the task, or perhaps because of it, now is a good time to step back and scrutinise the old enemy once again, but with fresher eyes. This is what we do in a thematic chapter of this year's AER. We look at inflation "under the hood" (UTH) as it were, to examine more closely how its engine works and to inform policy.

Looking UTH complements the perspective captured by a more traditional analysis based on, say, a stylised Phillips curve. It means examining in detail (1) how individual (sector-specific) price changes interact with the change in the aggregate price index, that is, inflation proper; and (2) how wage- and price-setting is influenced not only by cyclical factors – economic slack – but also by structural ones and, importantly, by the behaviour of inflation itself.

The result is a characterisation of the inflation process as two regimes – a low-inflation and a high-inflation regime, and transitions across them.

This complementary perspective yields at least three insights, which help to shed light on the current policy challenges.

First, low- and high-inflation regimes are very different. In a low-inflation regime, in contrast to a high-inflation one, inflation has important self-equilibrating properties.

Second, transitions from low- to high-inflation regimes tend to be self-reinforcing. As inflation increases, so does the risk that it becomes entrenched.

Finally, it is desirable for monetary policy to adapt to these regimes and to the transitions across them. Monetary policy can afford to be more flexible in a low-inflation regime, which it brings about and hardwires, and it needs to be especially timely and decisive during transitions.

Let me elaborate on these points.

Looking under the hood: stylised price behaviour

When examining the behaviour of the inflation engine at low and high revs, it is useful to consider, in turn, the relationship between sector-specific price changes and inflation, and that between wages and prices.

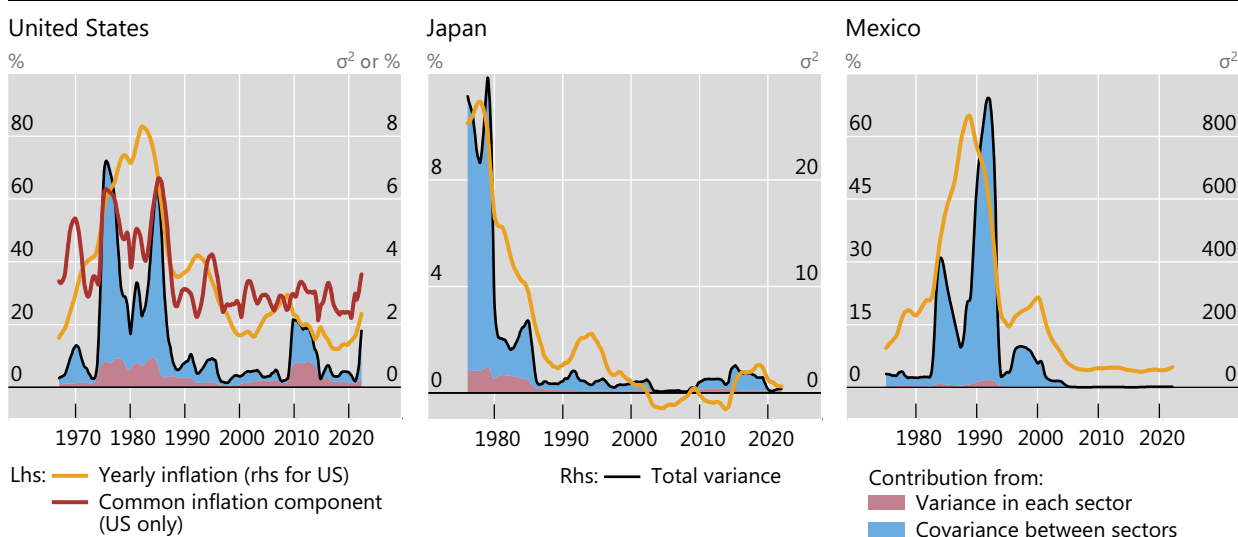
Individual price changes and inflation

Looking closely at the behaviour of sector-specific prices – well over 100 of them – reveals some otherwise hidden stylised facts.

First, when inflation has settled at a low level, its evolution largely reflects idiosyncratic changes in sector-specific prices –or “relative prices” – rather than their co-movement. The first panel in Graph 1, on the left, illustrates the point. The panel is based on data for the United States – for which the longest and most consistent statistical series are available. We see that, as inflation declines, so does the “common component” of price changes.

Low-inflation regimes: inflation volatility and price co-movement are lower¹

Graph 1



¹ Consumer price inflation, except US (personal consumption expenditure deflator). Calculated using sector-level data over a five-year rolling window.

Sources: CEIC; national data; BIS.

Second, and closely related, the well documented decline in the volatility of inflation associated with lower inflation does not reflect the decline in the volatility of individual price changes but, rather, that of their co-movement. Graph 1 illustrates this point, based also on data for Japan and Mexico, representative of a broader range of countries. We see that the blue-shaded area shrinks much more than the red-shaded area.

Third, and confirming the previous picture, in a low-inflation regime, the transmission across prices becomes more muted. We can see this in several ways. For one, spillovers across sectors

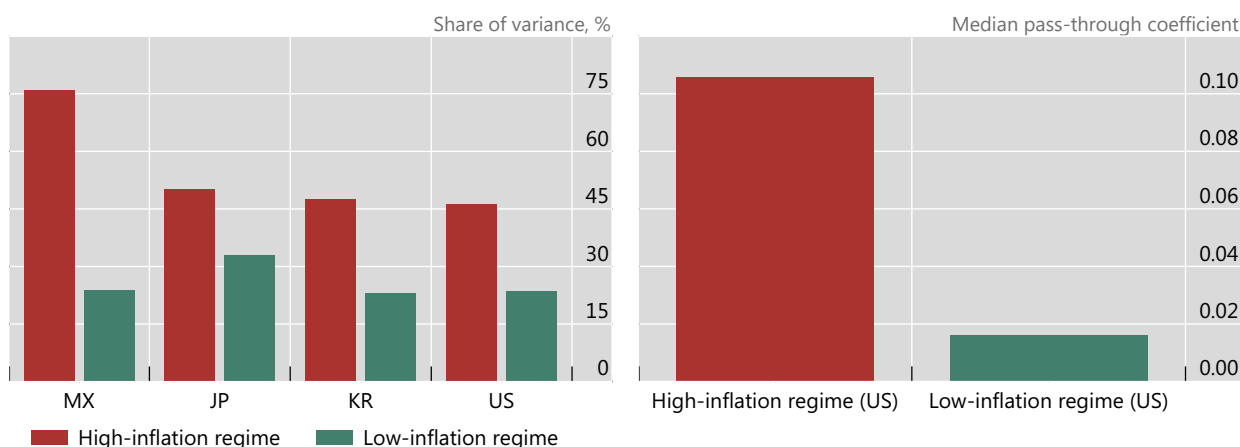
become less intense and pervasive, as indicated by an index of such spillovers (Graph 2, left-hand panel). Similarly, the pass-through of outside price increases to core inflation becomes hardly visible (right-hand panel). Finally, increases in the prices of salient items feed less into overall inflation. This holds for the impact of an oil price shock (Graph 3, left-hand panel) – in fact, the impact is even estimated to be negative, but is statistically hard to distinguish from zero. And it holds also for an exchange rate shock (right-hand panel).

Low-inflation regimes: relative price changes have smaller repercussions

Graph 2

Price spillovers across sectors are more muted...¹

...and outside price increases transmit less to core inflation



¹ Share of the variance of sectoral price changes explained by shocks to prices in other sectors over a horizon of one year.

Sources: C Borio, P Disyatat, D Xia and E Zakrajšek, “Monetary policy, relative prices and inflation control: flexibility born out of success”, *BIS Quarterly Review*, September 2021; Board of Governors of the Federal Reserve System; Federal Reserve Bank of St Louis, FRED; OECD; World Bank; CEIC; Datastream; national data; BIS.

These various findings are consistent with the well documented stylised fact that the persistence of inflation is lower in a low-inflation regime. That is, shocks to the inflation rate are more short-lived. In Graph 4, the persistence of price changes in a low-inflation regime is plotted on the horizontal axis; and that in a high-inflation one in the vertical axis. The left-hand panel portrays the behaviour of the aggregate price index. We see that most of the red dots – one per country in a representative sample – are above the 45-degree line.

Looking under the hood (UTH) sheds further light on this relationship, it indicates that this property holds also for sector-specific price changes. The blue dots, corresponding to multiple sectors per country – are also above the 45-degree line (right-hand panel).

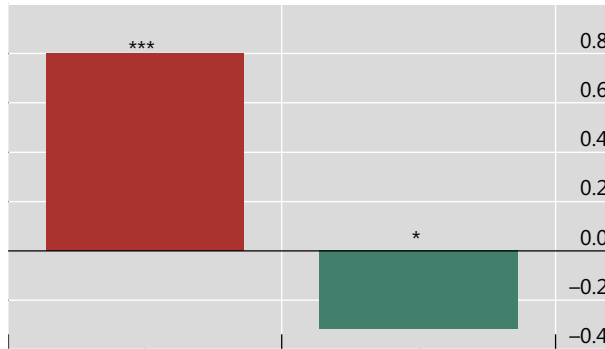
The broad picture that emerges is clear. A low-inflation regime, in contrast to a high-inflation one, has important self-equilibrating properties. Sector-specific price changes move together hardly at all, and they leave only a temporary imprint on the inflation rate.

Low-inflation regimes: the pass-through to inflation is weaker...

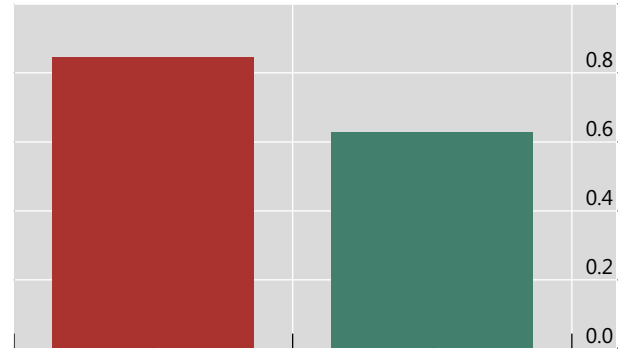
In percentage points

Graph 3

... from oil price changes...¹



... and from exchange rate depreciations



Response one year after a negative oil supply shock: ■ High-inflation regime ■ Low-inflation regime

Estimate: ■ High-inflation regime ■ Low-inflation regime

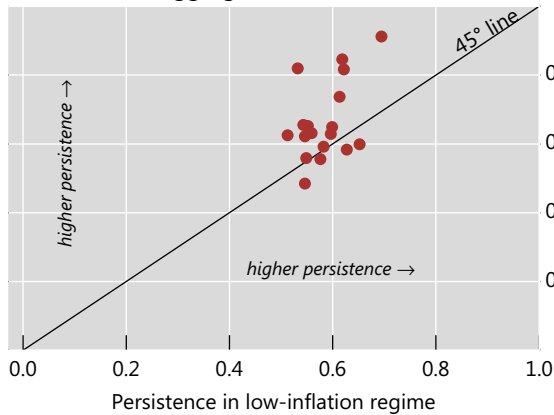
¹ ***/* indicates statistical significance at the 1%/10% level.

Sources: C Baumeister and J Hamilton, "Structural Interpretation of vector autoregressions with incomplete identification: revisiting the role of oil supply and demand shocks", *American Economic Review*, vol 109, no 5, 2019; Federal Reserve Bank of St Louis, FRED; national data; BIS.

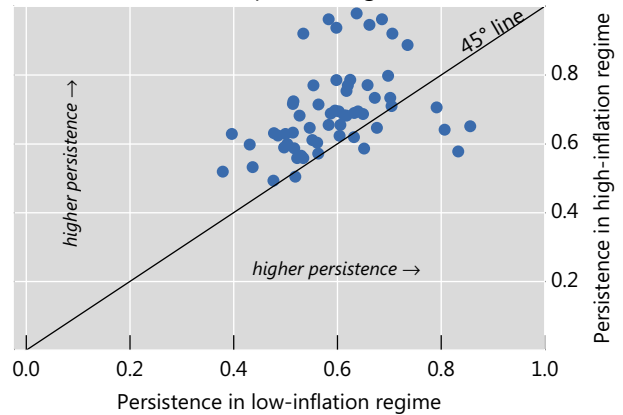
Low-inflation regimes: price changes are less persistent¹

Graph 4

Persistence of aggregate inflation



Persistence of sectoral price changes



¹ Persistence of one-month log price changes computed using sector-level data for representative sample of countries.

Sources: National data; BIS.

Wages and prices

The core of the inflation engine is the self-sustaining interaction between wages and prices. Ultimately, for inflation to become entrenched, wages must chase prices, and prices must chase wages – in so-called wage-price spirals. Thus, the stylised facts just described must be consistent with those concerning wage and price formation, which both reflects and determines those facts.

This is indeed the case, as illustrated in Graph 5, which is based on single-regression exercises. The response of wages to prices is milder in a low-inflation regime (left-hand panel) and so is that of prices to wages (right-hand panel).

Low-inflation regimes: the pass-through between wages and inflation is weaker

Coefficients

Graph 5



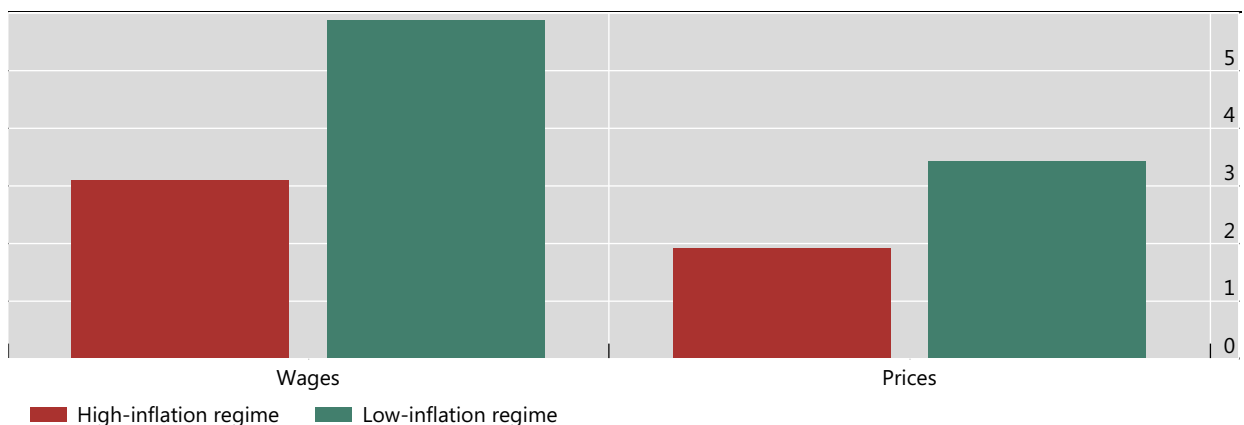
Sources: OECD; BIS.

The implication is that, in a low-inflation regime, wages and prices are more loosely linked. This can be shown more formally by examining their *joint* behaviour and the speed of adjustment to each other (Graph 6). We see that it takes considerably longer for wages and prices to catch up with each other.

Low-inflation regimes: wages and prices chase each other more slowly¹

In years it takes to recoup half of the shortfall

Graph 6



¹ The half-life is the time taken for half of the wage or price gap to have closed.

Sources: OECD; national data; BIS.

Transitions from low- to high-inflation regimes

So much for the stylised facts concerning the two regimes, but what about the transitions across them? Understanding the transitions requires delving deeper into the determinants of wage- and price-setting.

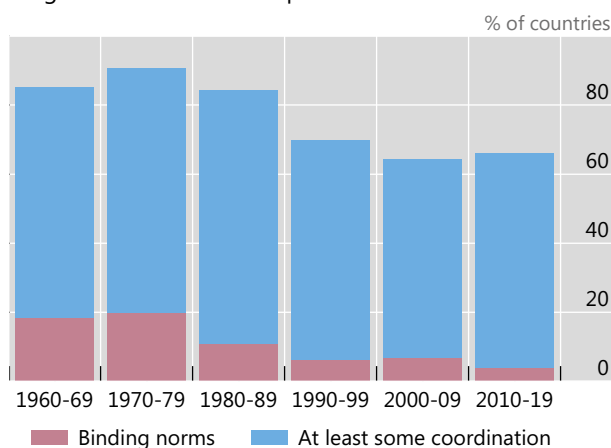
We know that, ultimately, the extent to which wages and prices chase each other depends on the incentives and pricing power of labour and firms. Three types of factor stand out.

The first type, which influences pricing power, comprises structural forces. The obvious candidates are globalisation, demographics and technology as well as political preferences concerning the role of market forces in the economy. In a Phillips curve, these factors are hidden in a possibly time-varying constant or time-varying slope.

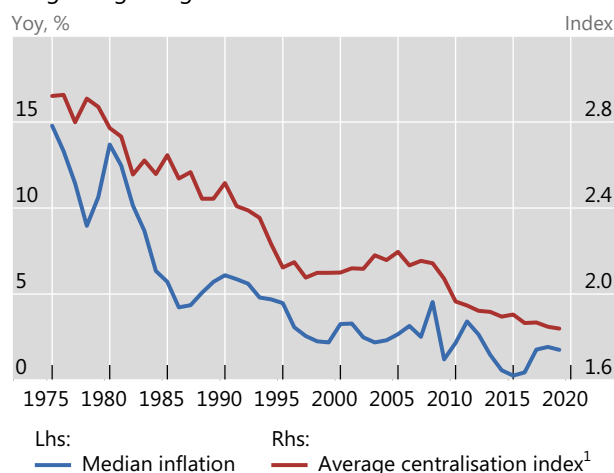
Bargaining power has declined over time

Graph 7

Wage coordination is less pervasive



Wage bargaining is less centralised



¹ Higher values indicate a higher degree of centralisation.

Sources: OECD/AIAS ICTWSS database; national data; BIS.

These forces can be very important (Graph 7). Indicators of labour's pricing power – such as measures of the degree of centralisation and stringency of wage bargaining – point to a steady decline since the 1980s (left-hand panel). And the decline helps explain the fall in inflation (right-hand panel), as confirmed by more formal econometric analysis. That said, structural factors move slowly. They do matter for transitions, but only operating in the background.

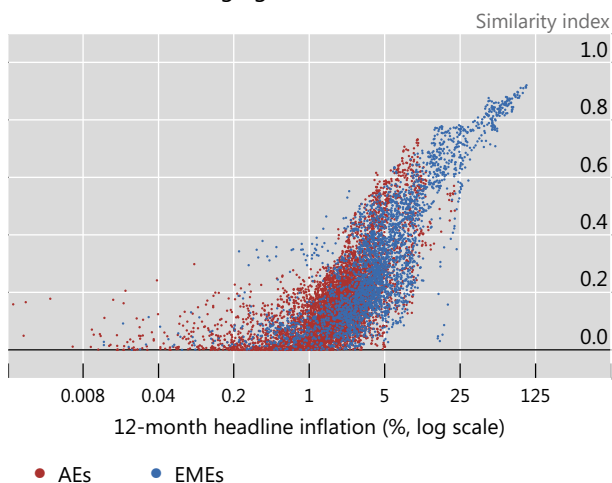
The second type of factor, which also influences pricing power, comprises cyclical forces, ie the state of aggregate demand relative to the economy's productive capacity – so-called "economic slack". Economic slack is what the Phillips curve focuses on, and is what monetary policy influences to shift inflation. It naturally plays a more prominent role during transitions.

The third factor is the evolution of inflation itself. This affects both incentives and, indirectly, pricing power and, importantly, is what tends to make transitions self-reinforcing.

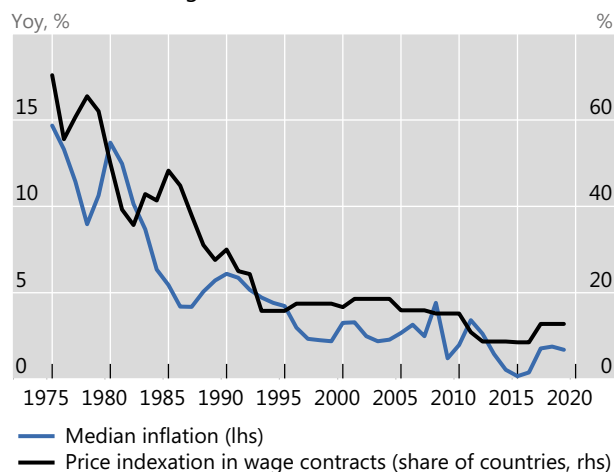
Higher inflation means more similar sectoral price changes and more indexation

Graph 8

Advanced and emerging market economies



Indexation in wage contracts



Sources: OECD/AIAS ICTWSS database; CEIC; national data; BIS.

How?

For one, as inflation drifts away from very low levels, it moves from the region of rational inattention into that of sharp focus. In addition, as the UTH perspective highlights, inflation becomes more representative. As the common component of price changes increases, the inflation rates that different agents experience become more similar (Graph 8, left-hand panel). The graph indicates that as inflation rises, so does the similarity of price change, as captured by a specific index. This holds for both advanced economies (red dots) and emerging market economies (blue dots).

In other words, as inflation increases, it becomes a more relevant focal point and coordinating device for the decisions of economic agents. This strengthens their incentive to seek compensation for losses in purchasing power or squeezes in profit margins *that they have already incurred*. This, in and of itself, can trigger wage-price spirals, *regardless* of what happens to inflation expectations. And since inflation expectations of workers and firms are backward-looking, higher inflation means higher expected inflation, which encourages agents to seek compensation also for *future* losses and squeezes. Moreover, once that happens, contract length will become shorter and price adjustments more frequent, adding fuel to the fire.

But the influence of higher inflation does not stop there. As inflation increases, it prompts efforts to strengthen pricing power, such as calls for greater centralisation of wage formation or for indexation or strikes. Indeed, there is a close link between the level of inflation and the incidence of indexation clauses (Graph 8, right-hand panel).

The bottom line is that higher inflation can trigger a self-reinforcing shift in inflation psychology. To put it in terms of the Phillips curve, during transitions its parameters are far from constant.

Monetary policy

What about the role of monetary policy?

Monetary policy has always played a key role in the inflation process, both in high-inflation regimes, such as the Great Inflation era; and in low-inflation ones, such as during the inflation targeting era that followed the Great Disinflation of the 1980s and 1990s.

Monetary policy exerts its influence on inflation in two ways. First, through the characteristics of the framework – think of the setup of a car. Relevant characteristics here include objectives, strategies, tools and institutional underpinnings, and not least the degree of the central bank’s independence from government. The framework is what has the biggest influence on inflation expectations as well as on the features of wage and price formation. Second, through changes in the policy stance within the framework – think of the accelerator and brake. Hence adjustments in interest rates and balance sheets as well as signalling. The stance is what has the biggest influence on aggregate demand.

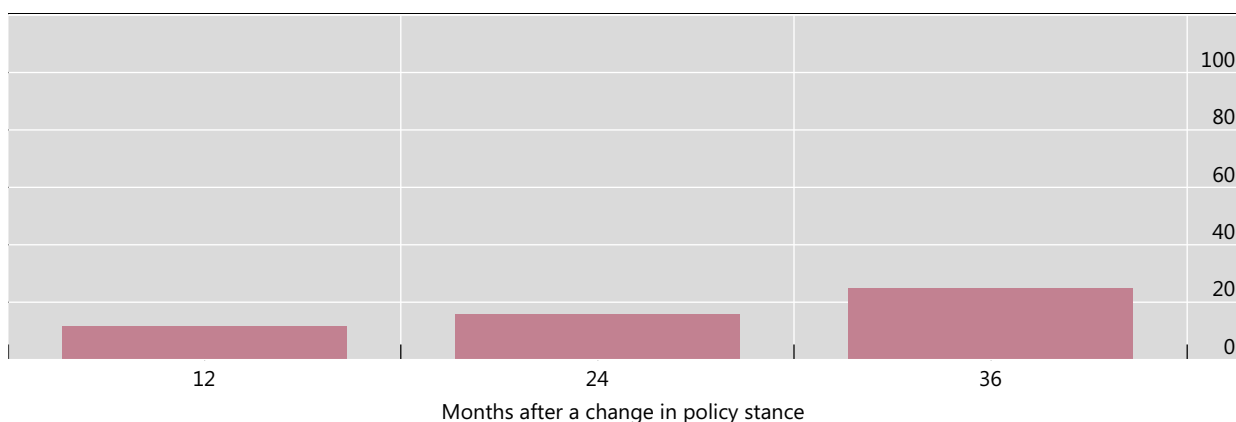
The UTH perspective sheds further light on the role of monetary policy, within inflation regimes and during transitions across regimes.

In a well established low-inflation regime, monetary policy can afford to be more flexible – that is, to tolerate more persistent, if moderate, deviations of inflation from narrowly defined targets. Having gained precious credibility, the central bank can reap the benefits. One reason is that, in such a regime, inflation exhibits important self-equilibrating properties. Another reason is that monetary policy seems to lose traction and, as a result, must adjust its instruments more vigorously. This, in turn, can heighten any negative side effects such as those linked to interest rates that stay unusually low for unusually long.

Monetary policy affects prices significantly only in a few sectors¹

As a percentage of PCE

Graph 9



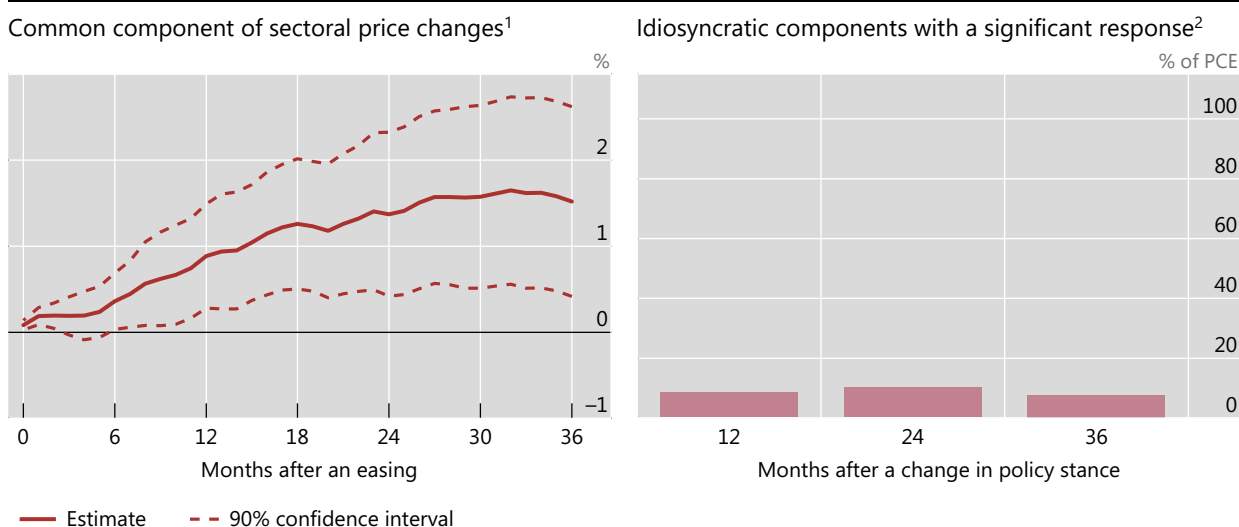
¹ Statistically significant responses at 10% level.

Sources: Board of Governors of the Federal Reserve System; national data; BIS.

As Graph 9, based on US data, indicates, in a low-inflation regime monetary policy operates through a remarkably narrow set of prices, mostly in the more cyclically sensitive service subsectors. We see that a change in the stance (a monetary policy “shock”) has a statistically discernible impact on a mere 30% of the consumption basket even after three years.

The loss of traction arguably reflects, at least in part, the dynamics of prices in a low-inflation regime. Intuitively, monetary policy should have a larger impact on the common component of price changes, which is more closely linked to aggregate demand, than on idiosyncratic price changes. And, as we saw, the common component falls substantially in a low-inflation regime.

Monetary policy overwhelmingly affects the common component of price changes Graph 10



¹ Response to a surprise policy easing of 25 basis points. Common component of sectoral price changes based on 131 narrowly defined personal consumption expenditure (PCE) sectors. ² Statistically significant responses at 10% level.

Sources: Board of Governors of the Federal Reserve System; national data; BIS.

The evidence is consistent with this conjecture (Graph 10). An easing of the stance has a clear impact on the common component of price changes (left-hand panel) but a hardly detectable one on their idiosyncratic component (right-hand panel).

But it is one thing to tolerate moderate deviations from point targets, and quite another to test the system’s self-equilibrating properties.

The self-reinforcing nature of transitions from low- to high-inflation regimes puts a premium on a timely and decisive response to safeguard price stability. Once a high-inflation regime becomes entrenched, transitioning back can be very costly, because of the changes in behaviour that it induces, and because the central bank’s credibility can be undermined. The risks are especially high in economies with a long history of inflation or weak macroeconomic fundamentals. There, transitions can be especially rapid, not least owing to sharp financial market-induced depreciations of the currency.

A challenge central banks face is that, as further discussed in the report, transitions are inherently uncertain. There is no fully reliable real-time indicator. And it is precisely during transitions that

standard models have the hardest time. Because of the self-reinforcing dynamics and because of the data on which they must be estimated, the models are least valuable when needed most. The most reliable indicator is clear signs of wage-price spirals – so-called second-round effects. But by the time they appear, the costs of taking remedial action may have already grown substantially. Judgment is at a premium.

Conclusion

To conclude, looking UTH at the inflation engine provides fresh insights. It encourages us to think of the inflation process as represented by two very different regimes with self-reinforcing transitions from low- to high-inflation ones. And it provides clues concerning how to adjust monetary policy to the features of these regimes, and to the all-important transitions across them underscoring the value of a timely and decisive response. The perspective is especially relevant today as central banks again face the once-but-no-longer familiar challenge of preventing one of those transitions.