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**ARE PRICES STICKIER
THAN USUAL? AN UPDATE
OF INFLATION
PERSISTENCE ESTIMATES
AND FORECAST
IMPLICATIONS.**

BOX 1: ARE PRICES STICKIER THAN USUAL? AN UPDATE OF INFLATION PERSISTENCE ESTIMATES AND FORECAST IMPLICATIONS.¹

During the recent period of extraordinarily high inflation, forecasting inflation has become very challenging. Indeed, overall HICP inflation forecasting errors have far exceeded historical average errors. These errors could stem from many sources, such as higher-than-expected commodity prices, unexpected government announcements, profit-margin behaviour, as well as model uncertainty. Another source of forecasting errors could be driven by indirect spillovers from energy to food commodity prices, as well as indirect spillovers from different subcomponents of the consumption basket.²

However, there is a possibility that inflation persistence might have increased during this period of high inflation. This box updates the study by Ellul and Micallef (2020), which had last estimated inflation persistence for Malta.³ In this study, persistence is estimated as the sum of autoregressive coefficients.

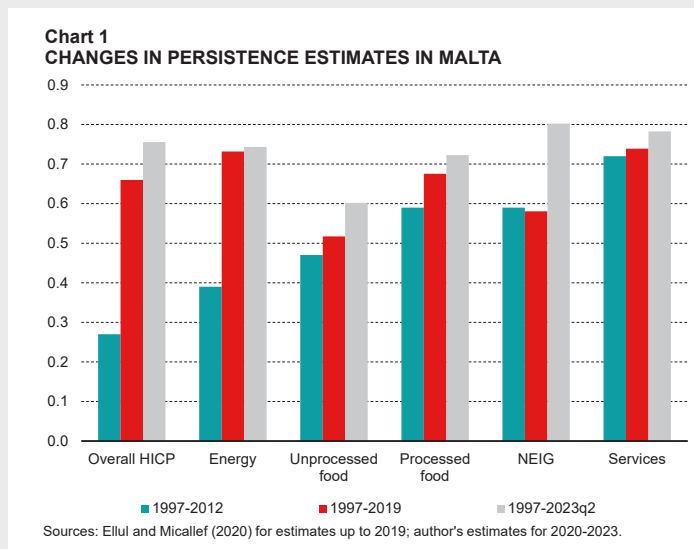
$$\pi_{i,t} = c_{i,t} + \sum_{k=1}^{K^*} \beta_{i,k} \pi_{i,t-k} + \varepsilon_{i,t} \text{ with } \rho_i = \sum_{k=1}^{K^*} \beta_{i,k} \quad (1)$$

where $\pi_{i,t}$ is the year-on-year inflation rate for a calendar quarter for index i , while the persistence parameter, ρ_i , refers to the sum of autoregressive coefficients. The optimal lag length K^* is identified by the Akaike information criterion.

This box extends Ellul and Micallef (2020) with rolling-window estimates of persistence, and then looks at the implications of this factor for the HICP projections.

Latest developments in inflation persistence

Chart 1 shows an update to the estimate of inflation persistence, considering the horizon 1997-2023. This is compared to estimates derived by Ellul and Micallef (2020) for the periods 1997-2012, and 1997-2019. Inflation persistence has increased considerably for overall HICP, as well



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² See for example: Rapa (2022) "The indirect impact of high food inflation on the development and outlook of catering services prices" Article published in the *Outlook for the Maltese Economy 2022:3*, pp. 11-14 <https://www.centralbankmalta.org/site/Reports-Articles/2022/Box2-2022-3.pdf>.

³ Ellul and Micallef (2020) "How Do Estimates of Inflation Persistence in Malta Compare with Other EU Countries?", *International Journal of Economics and Finance*, Vol. 12, No. 7 <https://ideas.repec.org/a/ibn/ijefaa/v12y2020i7p31.html>.

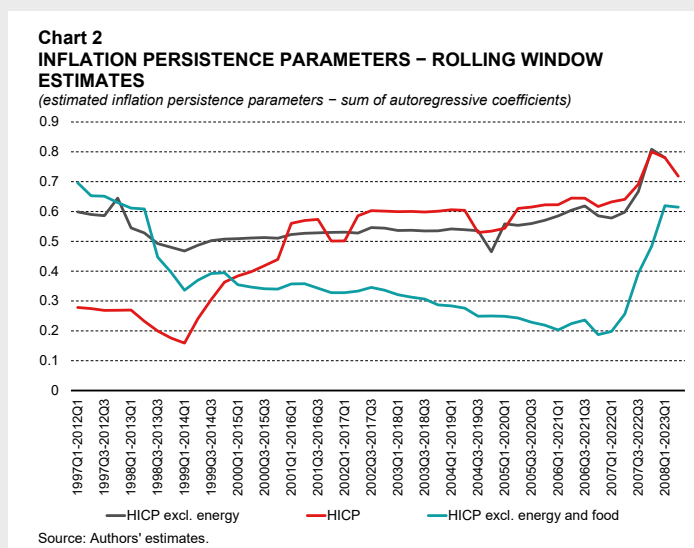
as most of its main subcomponents. The inflation persistence parameter for overall HICP has increased, from 0.66 for the period 1997-2019 to 0.76 for the period 1997-2023 Q2. This would suggest that the speed with which a process returns to its mean is longer than the 1997-2019 period.

In terms of subcomponents, we can observe a broad-based increase in inflation persistence, except for energy inflation. Energy prices are administered and thus already exhibit high persistence, particularly in view of the recent freezing in all energy prices since mid-2021. The largest increase in inflation persistence can be observed in NEIG, whose inflation persistence parameter went up from 0.58 to 0.80. Given that this component has a high import content, one factor behind this increase could be more persistent imported inflation.

To check whether we can observe a change in inflation persistence during the recent period of high inflation, we run the same exercise on smaller rolling windows. The first estimate is for the period 1997Q1-2012Q1, which is similar to that estimated by Ellul and Micallef (2020) for the same period and reproduced in Chart 1 above. Then the estimation window is rolled over by one quarter for both the start date and end date (for example, the second estimate window is 1997Q2-2012Q2, and so on).

Chart 2 shows the evolution of estimated inflation persistence parameters. Firstly, we can observe that inflation persistence for overall HICP increased markedly between the period 2014 to 2016 and remained stable for most of the period thereafter. However, a sharp increase in inflation persistence can be detected since the incorporation of 2021Q4 in the estimation window, which is consistent with the period in which inflation exceeded the long-term average inflation rate of 2.3%. Since the beginning of 2023, overall persistence has declined, though this remains elevated. We can observe a similar development in HICP excluding energy, in which persistence has declined slightly since the beginning of 2023 but remains rather elevated.

Moreover, Chart 2 shows that inflation persistence in HICP excluding



energy and food was on a downward trend during the period 2014-2021. However, inflation persistence rose sharply since 2022, from just 0.19 in the 2006Q4-2021Q4 estimated window, to 0.62 in the 2008Q1-2023Q2 window. In addition, persistence seems to have peaked since the start of 2023 at very high levels, though we do not observe a decline as we do in the case of overall inflation.

Chart 3 elaborates further on the subcomponents of HICP. There was a substantial decline in the persistence of services inflation after 2018, reflecting much lower inflation persistence in services related to recreation. However, since the end of 2021, inflation persistence in services inflation has picked up markedly. This has peaked since the beginning of 2023.

With regard to NEIG, inflation persistence was rather stable over time until just before the pandemic. However, since the end of 2021, it has shot up sharply and has reached almost unity by 2023Q1. The latter is consistent with a unit root process in the data, which would mean that inflation can remain high for an infinite period, though this result is likely to be temporary and affected by the rolling-window sample period chosen for this exercise. One should expect some return to lower inflation persistence in the near term.

Chart 3
INFLATION PERSISTENCE PARAMETERS – SUBCOMPONENTS

(estimated inflation persistence parameters – sum of autoregressive coefficients)



Source: Authors' estimates.

We can also observe a very sharp increase in persistence of food inflation since the end of 2021. Similar to goods inflation, inflation persistence in food was rather stable prior to the recent period, except for some increase in the period 2016-2019. Yet, since end 2021, it has exhibited very high persistence, second only to NEIG, which also indicates that the sharp rise in inflation persistence observed until the first half of 2023 was mostly driven by persistently high imported inflation. We can also observe some slight decline since the beginning of 2023.

Persistence in energy inflation had increased sharply since 2014, which, as Ellul and Micallef (2020) had indicated, reflected the impact from energy reforms introduced since 2013. These reforms introduced a prolonged period of price stability in energy prices due to long-term bilateral contracts for electricity prices, as well as other hedging agreements for fuel and gas. Persistence in energy inflation remained stable during the recent period despite the sharp rise in international commodity prices. This reflects the government's policy to maintain fixed energy prices throughout the recent period of large shocks in international commodity prices.

The sharp increase in the estimated inflation persistence in this box needs to be interpreted with caution. Firstly, this analysis relies on an autoregressive methodology, which could be strongly affected by structural breaks. Hence, inflation persistence parameters might spuriously be high.

Moreover, the lack of structural identification implies that this approach is unable to account for the reasons behind the sharp rise in price stickiness. Indeed, the observed increase in inflation persistence might be temporarily affected by very large successive shocks, which could be for the most part, imported. For example: inflation-inducing shocks such as the pandemic-related recovery, the ensuing global supply-chain disruptions, as well as the Russia-Ukraine war happened successively in a very short period of time, which might be keeping headline and underlying inflation high for a very long time. Meanwhile, these very high successive shocks might have been accompanied by higher profit margins (see Box 2). At the same time, wages typically respond with some lag due to long wage contracts. Thus, wage pressures have only recently picked up and are likely to affect inflation in the next few years, which may contribute to higher inflation persistence.

Therefore, these results cannot yet be interpreted as indicative of a fundamental change in behavior. Inflation persistence might decline to their historical average over time as the impact from these shocks gradually fades away.

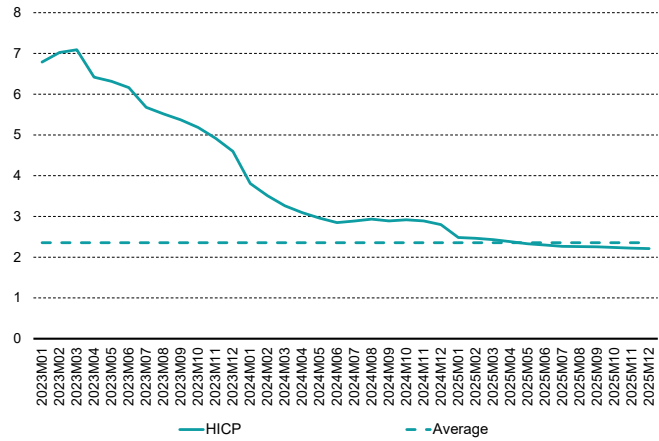
Implications for projections

In view of the recent increase in inflation persistence, HICP is projected to remain high from a historical perspective for a prolonged period. At the same time, we expect inflation persistence to decline over time and to slowly revert to their historical averages as the impacts from global supply chain disruptions and the Russia-Ukraine war slowly fade away. However, we expect that during the projection horizon, price stickiness will remain rather elevated in

view of the lagged effect from wages.

Chart 4 shows that inflation is projected to remain above its long-term average until the first quarter of 2025. We then expect overall HICP to undershoot slightly the long-term average in the last six months of 2025 as we foresee some reduction in inflation persistence.

Chart 4
MONTHLY INFLATION PROJECTIONS
(annual percentage change)



Source: Central Bank of Malta.