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Inflation Persistence
in Austria*

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“Stubborn” Inflation in Austria?

Introduction and a Very Long-Term View

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1. Introduction

Price setting and inflation perception are topics which attract interest well beyond the narrow circles of central banks and academia. Public debate about oil distributors’ pricing policy or the heated discussion about the mostly just perceived price impact of the cash changeover to the euro are just two recent examples of how relevant the development of prices continues to be in public perception. Until recently, empirical knowledge about pricing behaviour was surprisingly limited though. Lack of available data was partly responsible for this.

In consideration of inflation rates hovering above 2% despite weak economic growth over recent years, the Eurosystem set out to explore the reasons underlying this “persistence” of inflation by establishing the “Inflation Persistence Network (IPN)”. In parallel, other economists joined forces with psychologists to explore how people’s perceptions of inflation – as opposed to official, statistically measured price developments of consumer baskets – are formed. The Oesterreichische Nationalbank (OeNB) has conducted a considerable body of research over the past two years in these two areas, mainly with a focus on the Austrian situation, some for the euro area as whole. The purpose of this workshop and proceedings volume is to present the findings to the Austrian economic policy community and to possibly draw some policy conclusions.

This article is structured as follows. First, the motivation for the study of inflation persistence and price rigidity is discussed. Next, various data sources and analytical approaches are discussed. Third, the terms inflation persistence and price

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rigidity are defined and distinguished from each other, and measurement issues are raised. Fourth, eleven stylized facts on inflation persistence and price rigidity for the euro area as a whole, as they emerged from the IPN, are summarised, in order to put results on Austria, presented in later articles in this volume, in perspective. Then, the role of perceived inflation and its relevance for monetary policy is explained. Finally, a very long-term view on inflation and inflation persistence in Austria is presented, which raises some interesting questions about some commonly accepted stylised facts with respect to inflation and inflation variability.

2. Why Study Inflation Persistence and Price Stickiness?

Studying empirically price-setting behaviour can be useful for monetary and economic policy making in various ways. In the first place, it serves as a test for the various theories of price setting currently used in economic models. By selecting empirically valid theories, it will eventually allow to build forecasting and policy simulation models better fit to the actual behaviour of the economy. In a similar way, these insights will also allow to better understand the nominal and real effects from various shocks. This can help, for one thing, to design a monetary policy strategy better capable to support the achievement of price stability, through reducing inflation volatility and stabilising inflation expectations. For another, it can help to make more appropriate ongoing monetary policy decisions. So, there are obvious benefits for monetary policy in the euro area.

Moreover, comparing reactions of the economy to various shocks for different degrees of inflation persistence and price stickiness can also suggest desirable structural features of an economy, and thus inform possible general directions for structural policies which affect price formation. Such implications can be relevant in general, for the EU's and euro area's structural policy agenda (e.g. Lisbon Agenda) and for economic policy in the individual countries.

Standard economic models (e.g. Smets and Wouters, (2003)) predict that stickier prices will increase the persistence of output deviations from potential after shocks. Furthermore, strong differences in inflation persistence due to different price stickiness among euro area countries would entail asymmetric effects on the various euro area countries even from fully symmetric shocks and different transmission of the single monetary policy on inflation and growth in the various euro area economies. Recommendations on structural policy measures to influence price and wage setting behaviour with a view to achieving more symmetrical economic responses to shocks and to monetary policy could emerge.

Finally, at the level of the individual country and an individual national central bank, a clearer understanding of shocks and their nominal and real economic effects should help to put together better informed and more accurate forecasts of inflation and real economic developments. This has benefits for both, national

policy makers, e.g. for fiscal policy, and for economic agents at large, to the extent that it were to reduce decision uncertainty.

3. Various Data Sources and Analytical Approaches

Phenomena of inflation persistence and price rigidities can be analysed at various levels of the economy. Major innovations from the research presented at this workshop include, first, the exploitation of various sources for micro data, i.e. information on individual consumer prices or individual firms’ price setting, be it through the use of individual consumer price data or through questionnaires to enterprises.

Table 1: Various Data Sources and Analytical Approaches, as Reflected in the Structure of the Workshop

Block 1: Micro level		Block 2: Macro/sectoral level		Block 3: Economic psychology
Micro CPI	Firm-level surveys	Macro time series	Structural Models of Inflation Dynamics	Survey data on inflation perceptions and expectations
Baumgartner, Glatzer, Rumler, Stiglbauer: <i>The Dynamics of Individual Consumer Price Data for Austria</i>	Kwapil, Baumgartner, Scharler: <i>The Price-Setting Behavior of Austrian Firms: Some Survey Evidence</i>	Baumgartner: <i>Inflation Persistence in Austria – First Results for Aggregate and Sectoral Price Series</i>	Rumler: <i>Estimates of the Open Economy New Keynesian Phillips Curve for Euro Area Countries</i>	Stix: <i>Perceived Inflation and the Euro: Why High? Why Persistent?</i>

Panel Discussion: Policy conclusions

Second, these micro-level studies are supplemented by macroeconomic studies, using time-series approaches, on the one hand, and structural models (based on an open economy hybrid New Keynesian Phillips Curve), on the other. Third, in an interdisciplinary approach involving insights from economic psychology, survey data on inflation perceptions and expectations which summarize the “consumer’s view” are introduced. The combination of these three complementary strains of research should allow to draw more informed policy conclusions. The various data sources and approaches are also reflected in the structure of the workshop (table 1).

4. Some Conceptual Issues: Inflation Persistence versus Price Stickiness

Price stickiness is a commonly used concept in economics. Inflation persistence is less well known. It is important to distinguish the two concepts.

Price stickiness can be defined as the tendency of prices to be changed infrequently. This can be due to various reasons. First, various frictions may discourage price changes that would actually be appropriate. If this hampers an adjustment of relative prices, it entails welfare losses. If price stickiness entails slow adjustment of the general price level to economic shocks, it can imply higher costs in terms of losses of output. Second, price stickiness can also reflect stable inflation expectations. If the commitment and ability of monetary policy to maintain price stability is perceived to be credible, there is less reason to change prices frequently. Finally, infrequent adjustments of prices can reflect a conscious pricing policy of firms to please customers, who may regard frequent price changes as a kind of cheating or wish to avoid the search cost involved with frequent price changes.

Inflation persistence is defined as the tendency of inflation to converge slowly towards its long-run value following shocks. The long-run value of inflation is in principle implied by the monetary policy regime. It can take the form of an implicit or explicit inflation target. Importantly, this long-run value may change over time. Take the following reduced-form model of inflation, with π_t being inflation in period t and μ_t being a shock:

$$\pi_t = (1-\rho)\pi^* + \rho\pi_{t-1} + \mu_t$$

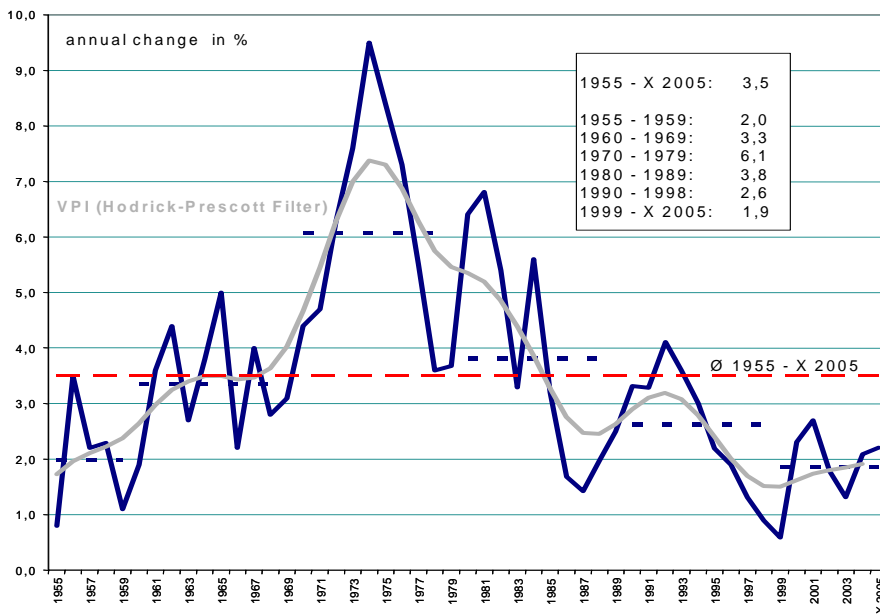
Inflation persistence in this model is estimated by the parameter ρ , which can be described as the sum of the parameters on lags of inflation in an autoregression of inflation. The bigger ρ , the more inflation is influenced by its own past values, and the more slowly it returns to its long run value π^* . A bigger ρ thus implies higher inflation persistence. The extreme case with $\rho=1$ represents a situation where shocks to inflation persist indefinitely and thus inflation does not return to the long-run equilibrium value after a shock.

When estimating inflation persistence, a crucial issue is how to determine the “long-run average” inflation rate. If the central bank’s inflation target or definition of price stability were explicitly given, this would be a trivial issue. In practice, however, inflation targets are not always known explicitly. Explicit, publicly announced inflation targets or definitions of the price stability objective have only become wide-spread over the past 10 or 15 years. Particularly for time series going back further into the past and for those monetary policy regimes for which also today no quantitative definition of price stability has been published, “long-run inflation” needs to be assessed empirically. If it is assumed to be unchanged for very long time periods, say decades, actual inflation will take longer after shocks to return to this long-run inflation; estimated inflation persistence will thus be bigger. Conversely, if “long-run inflation” is assumed to change more frequently over time – to some extent in line with actual inflation – then estimated inflation persistence will be smaller. Thus, estimations of inflation persistence are heavily influenced by the researcher’s inferences about the underlying monetary policy regimes and inflation objectives, besides many further econometric issues, which may also heavily influence the estimated measures for inflation persistence (see, e.g., Robalo-Marquez, (2004)). Two commonly used approaches to address the issue of changing inflation objectives are the identification of regime breaks, on the one hand, and the use of time-series smoothing methods, on the other. The more frequent regime changes are allowed or the more closely the smoothed “long-term inflation” follows actual inflation, the smaller estimates of inflation persistence tend to be. Chart 1 illustrates how strongly inflation for Austria varied over the last half century. Note also that it is not clear at all what the inflation objective in Austria was during the second half of the 20th century, prior to participation in the euro area.

Inflation persistence can have various sources. An illustrative way to conceptualize these sources is the hybrid New Keynesian Phillips Curve (see e.g. Ruml, in this volume). The equation states that inflation (the change in the price level p) in period t depends on inflation in the previous period, expectations of inflation in the next period, on marginal costs mc_t and on a shock u_t .

$$\Delta p_t = \gamma \Delta p_{t-1} + (1-\gamma) E_t \Delta p_{t+1} + \kappa mc_t + u_t$$

Chart 1: Inflation in Austria



Source: Statistics Austria.

Based on this formula, three sources of inflation persistence have been distinguished in the IPN (see, e.g., Angeloni et al., (2005b)). First, “*extrinsic inflation persistence*” can be described as the persistence inherited from the driving fundamentals of inflation, such as real marginal cost (real wages, real cost of capital...) or the output gap; it is influenced by degree of price stickiness, which in turn affects κ , the slope of the Phillips Curve or, in other words, the elasticity of inflation with respect to changes in marginal cost. Second, “*intrinsic inflation persistence*” describes the dependence of inflation on its own past; it is not driven by fundamentals and is captured in the above equation by γ , a measure of the backward lookingness of price formation. Intrinsic inflation persistence can, for instance, arise from (backward-looking) inflation indexation of contracts or from “rules of thumb” price setting by firms. Finally, “*expectations-driven inflation persistence*” arises if some kind of “learning” behaviour rather than fully rational expectations slows the return of inflation to its target. For example, assuming less than perfect information, price setters may take time to learn about the nature of a shock, which may lead to a gradual and more persistent response of inflation to a shock.

Estimations of price rigidity can be grouped into two branches of methods. On the one hand, micro studies of price-setting behaviour often measure the frequency

(the percentage) of price changes per unit of time (e.g. one month) or the average duration of prices. The higher the frequency or the shorter the duration, the more flexible prices are. On the other hand, structural approaches measure price rigidity by means of a parameter in the New Keynesian Phillips Curve (see e.g. Rumlér, in this volume).

5. Inflation Persistence and Price Stickiness in the Euro Area – Some Stylized Facts

Research in the IPN has yielded a number of interesting stylized facts on inflation persistence and price stickiness in the euro area.

First, inflation persistence seems to have fallen over the nineties in many OECD countries including the euro area (cf. Angeloni et al., (2005a)), although this is hard to prove econometrically (see O’Reilly et al., (2004)). *Second*, inflation persistence in the euro area is moderate and similar to the U.S.A. (Álvarez et al., (2005b), Gadzinski et al., (2004)). *Third*, inflation persistence in the euro area appears to be mostly extrinsic, i.e. it is driven by the persistence of its determinants, such as wages and input costs (Álvarez et al., (2005b)). *Fourth*, recent estimates of New Keynesian Phillips Curves show that forward-looking expectations generally dominate over backward-looking behaviour (Rumlér, in this volume). Expectations-driven inflation persistence turns out to be low in the euro area: inflation expectations are well anchored to the inflation objective. *Fifth*, estimates of intrinsic inflation persistence suggest that the latter is currently low in the euro area (Levin et al., (2004))

Sixth, prices are stickier in the euro area than in the U.S.A. (see eg. Galí et al., (2001a), (2001b)), in a New Keynesian Phillips Curve the responsiveness to marginal cost or the output gap is lower (table 2). Note, however, that this may (partly) also be due to lower inflation in the euro area as compared to the U.S.A. (lower inflation requires less frequent price changes).

Table 2: Price Stickiness in the Euro Area versus the United States

	Measure of price stickiness	Euro area	U.S.A.
CPI	% of prices changed each month	15.1	24.8
	Average duration (<i>months</i>)	13.0	6.7
	Median duration (<i>months</i>)	10.6	4.6
PPI	% of prices changed each month	20.0	n.a
Surveys	% of prices changed each month	15.9	20.8
	Average duration (<i>months</i>)	10.8	8.3
New Keynesian Phillips Curve	Average durations (<i>months</i>)	13.5–19.2	7.2–8.4
Internet prices	% of prices changed each month	95.5	94.7

Source: *Álvarez et al. (2005b)*. For methodological details and references to the various studies underlying this table see there.

Seventh, there is no evidence of general downward consumer price rigidity in the euro area. 42% of consumer price changes are price reductions. Importantly, however, downward price rigidity in the service sector is considerably higher. *Eighth*, consumer price increases and decreases are sizeable at 8% and 10% respectively. Price reductions are even slightly bigger than increases (Dhyne et al., (2005); see table 3).

Table 3: Share and Average Size of Consumer Price Increases and Decreases

Sector		Unprocessed food	Processed food	Energy	Non-energy industrial goods	Services	Total
Share of price increases		54	54	54	57	80	58
Size of price increases		15	7	3	9	7	8
Size of price decreases		16	8	2	11	9	10

Source: *Dhyne et al. (2005)*, pp. 20 and 22. Results are based on a sample of 50 products.

Ninth, there is considerable heterogeneity in the frequency of consumer price changes across products. Prices for energy and unprocessed food are changed frequently, those for non-energy industrial goods and services are changed rather infrequently. *Tenth*, heterogeneity across countries is less important than across products or sectors. To the extent that there is cross-country heterogeneity, it is partly related to differences in consumption structure and different statistical treatment of sales (see Dhyne et al., (2005); Lünemann et al., (2004)).

Table 4: Average Percentage of Consumer Prices Changed Each Month

CPI	Unprocessed food	Processed food	Non-energy industrial goods	Energy (oil products)	Services	Total (country weights)
Euro area	28.3	13.7	9.2	78.0	5.6	15.1
U.S.A.	47.7	27.1	22.4	74.1	15.0	24.8

Source: Dhyne et al. (2005) for the euro area, Bils and Klenow (2004) for the U.S.A. Results for the euro area are based on a sample of 50 products. ES: no energy products included.

Eleventh, the IPN brought interesting and important insights on the motives which drive producer pricing behaviour in the euro area (Fabiani et al., (2005)). Questionnaires sent to enterprises confirmed that the existence of implicit contracts, explicit contracts, cost-based pricing and coordination failure are able to explain producer pricing behaviour best. By contrast, menu costs, information costs and pricing thresholds turned out to be comparatively unimportant reasons for not changing prices. It also turned out that enterprises react asymmetrically to different types of shocks: Cost shocks were considered more important for price increases, while weakening demand or stiffer competition were quoted as being more important for price reductions. Finally, input prices were shown to drive producer price flexibility. Thus, in branches with high labour input prices are more sticky, while branches with a high raw material input and products at low stages of production witness more frequent price adjustments (see Álvarez et al., (2005a)).

6. The Role of “Perceived Inflation”

The concept of “perceived inflation” has been widely discussed in recent years. It refers to the notion that – whatever official, statistically measured inflation figures state – economic agents might have a different individual perception of inflation.

Particularly in the wake of the changeover from national currencies to the euro, perceptions of inflation had a tendency to deviate more strongly from official, statistically measured consumer price inflation than otherwise. Such perceptions can not be observed directly but have to be estimated, e.g. on the basis of consumer surveys (see e.g. Fluch et al., (2005)), which in itself entails a number of conceptual issues.

The important point is that economic agents’ behaviour is ultimately not influenced by “reality” (as for instance approximated by official statistical data) but rather by their own perceptions of reality. At the level of the individual, this may be due to individual consumption baskets different from the one used in statistical measurement. This should, however, equal out for the economy as a whole. But it may also reflect the way in which perceptions are formed, an issue which is studied by (economic) psychology. Systematic biases in price perceptions may also affect inflation perceptions in the aggregate. This has several important implications.

First, the central bank’s ability and credibility to maintain price stability is assessed by economic agents not on the basis of statistically measured HICP inflation but by their perception of inflation and its change over time. Public satisfaction or discontent with the central bank’s performance thus hinges on perceptions, rather than “facts”.

Second, inflation expectations are thus also likely to be influenced by perceived, rather than official current and past inflation (besides other factors). Commonly used models of inflation, which nowadays often include a term of inflation expectations, do not capture this important and complex channel of inflation expectations formation. Inflation perceptions are thus also likely to influence wages and actual inflation as well as sacrifice ratios.

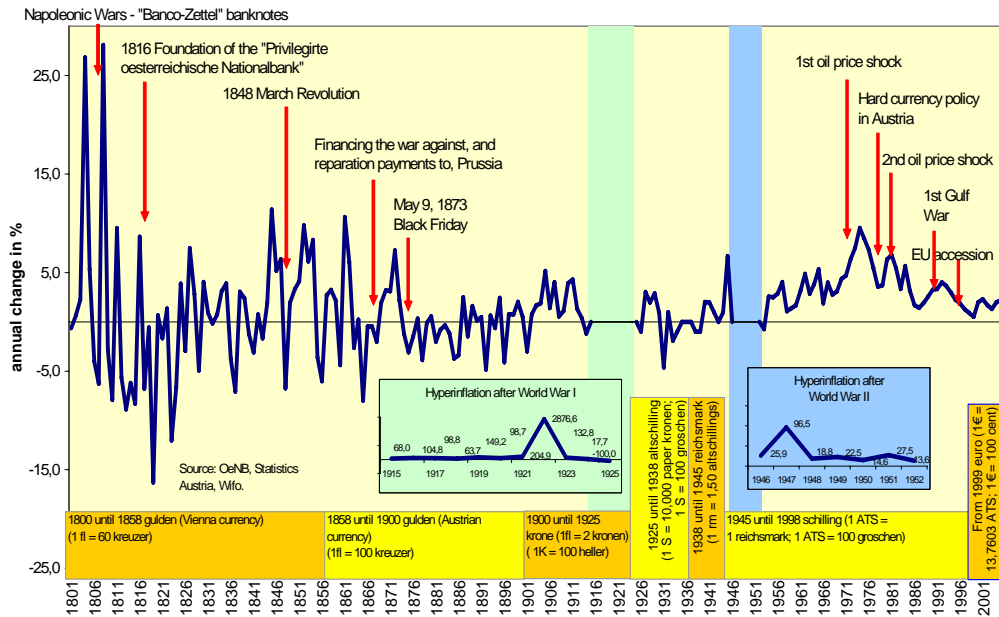
Understanding the psychology of perceived inflation is thus crucial for inflation forecasting, for the design of a monetary policy strategy and for the ongoing conduct of monetary policy. It should also feed into the central bank’s communication with the public and motivate central bank educational activities. In short, it is no use to label inflation perceptions as “right” or “wrong”. Psychological features of the formation of perceptions can only be taken as a starting point for the central bank to work with.

7. Inflation and Inflation Persistence in Austria – A Very Long-Term View

A brief look at the past 200 years of the history of inflation in Austria (see chart 2) yields a number of interesting insights. First, currencies and monetary regimes do not last forever. Before the euro was introduced in Austria, Austria had six currencies since 1800. Three of them (gulden (Vienna currency), gulden (Austrian

currency), Austrian schilling) lasted for roughly half a century each. Others, such as the krone, the Altschilling or the Reichsmark, lasted for a quarter of a century or less.

Chart 2: Inflation in Austria since 1800



Source: Statistics Austria; Pech (2002), Pressburger (1966), Schubert (2005).

Second, inflation varied sharply over the last 200 years. Most notably, it reached nearly 2900% and 100%, respectively, at the peaks in 1922 and 1947 during two periods of hyperinflation. But it also reached 25% or more in the aftermath of the Napoleonic Wars and 10% or more in several years around the middle of the 19th century and in the aftermath of the first oil price shock in the 1970s (a period commonly labelled the “Great Inflation” in the U.S.A.). Particularly in the 19th century negative inflation was very common, often prevailing over extended periods of time. The deflation around 1930 was quite short and of a small magnitude – in terms of the fall in the price level – compared to the experiences in the 19th century. Third, the major sources of high inflation were wars. The “Great Inflation” was noteworthy in the sense that comparatively high inflation was generated without such an emergency situation but as a result of expansionary monetary policy in the aftermath of a cost push shock. Central bank independence has long been considered as a way to avoid excessive money creation and the

erosion of the value of money. However, the history of the Oesterreichische Nationalbank, particularly during the 19th century, shows (see, e.g. Pressburger, (1966), Schubert, (2005)) that the multiple moves to grant the central bank higher independence were never long-lasting once the government faced financing problems, triggering yet further waves of inflation. More recently, price stability in Austria has benefited from accession to the EU and participation in the euro area.

A simple econometric exercise can be carried out in order to assess the dynamics of inflation persistence in Austria for the last two centuries. We fit a simple autoregressive model for the inflation series using 20-year overlapping windows, and report the estimates of the autoregressive parameter (measuring “short run persistence”) and the unconditional expectation of the process (measuring “long run inflation”).²

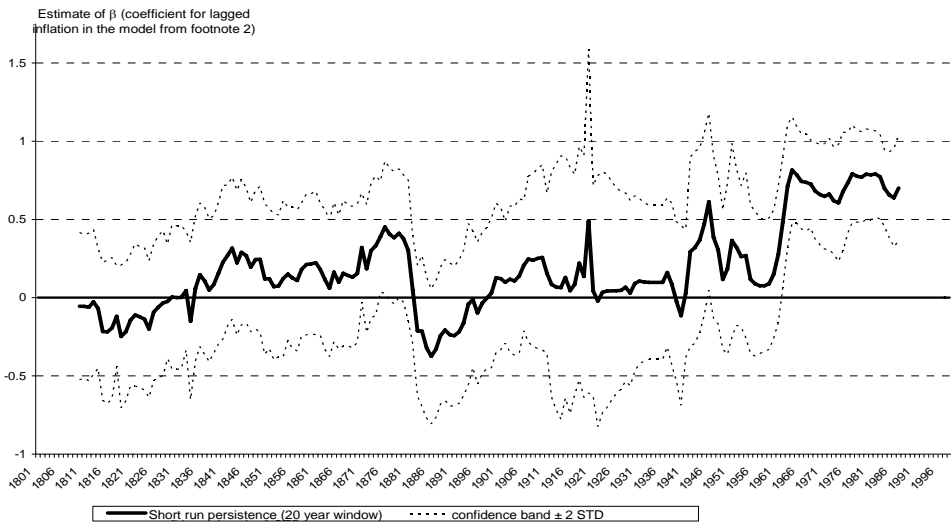
Chart 3 presents the estimates of the short run persistence measure for the period studied (together with confidence bands entailing twice the standard deviation of the estimate) and yields the interesting conclusion that only from the mid 1960s has inflation become significantly persistent. For the earlier subsamples, the persistence estimates tend to be insignificantly different from zero. The estimates of the long run average inflation show that the unconditional expectation of the simple data generating process for inflation used is only significantly positive in a systematic fashion from the 1960s onwards, coinciding with the appearance of significant short run persistence in the series.

This finding fits well with the evolution of long-run average inflation (as estimated as the unconditional expectation of the above autoregressive model). Only from the 1950s did inflation become significantly different from zero for an extended period of time.

Chart 5 shows long run inflation average together with the evolution of inflation volatility over the past two centuries (excluding hyperinflation episodes). Inflation volatility was relatively high during the first two decades of the 19th century, reached another peak around the middle of the 19th century, and fell steadily until the end of the century. Interestingly, inflation volatility has not changed too much since the late 19th century up to recently.

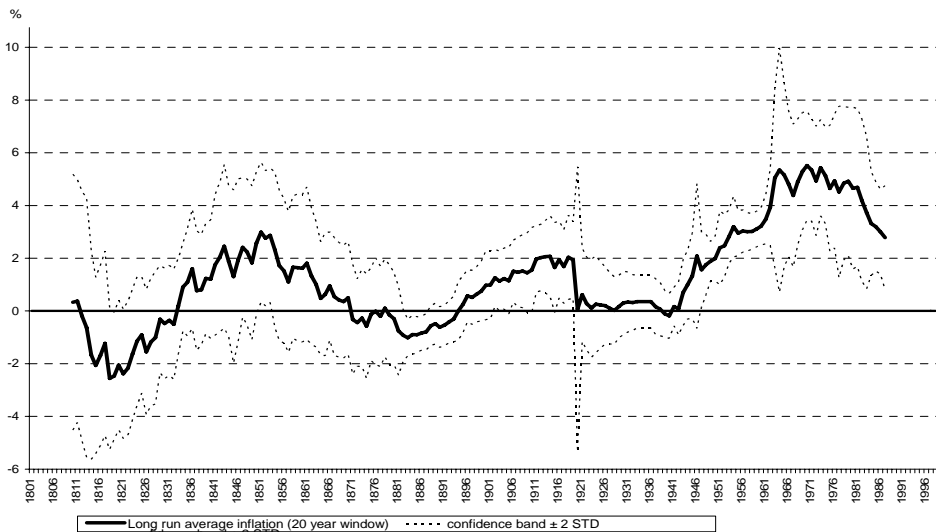
² The model used is $\pi_t = \alpha + \beta\pi_{t-1} + u_t$, where the error term is assumed to be white noise. The short run persistence is measured by the estimate of β and long run average inflation is measured by the estimate of $\alpha/(1-\beta)$. All the estimations were carried out eliminating the hyperinflation episodes.

Chart 3: Inflation Persistence in Austria – a Relatively Recent Phenomenon



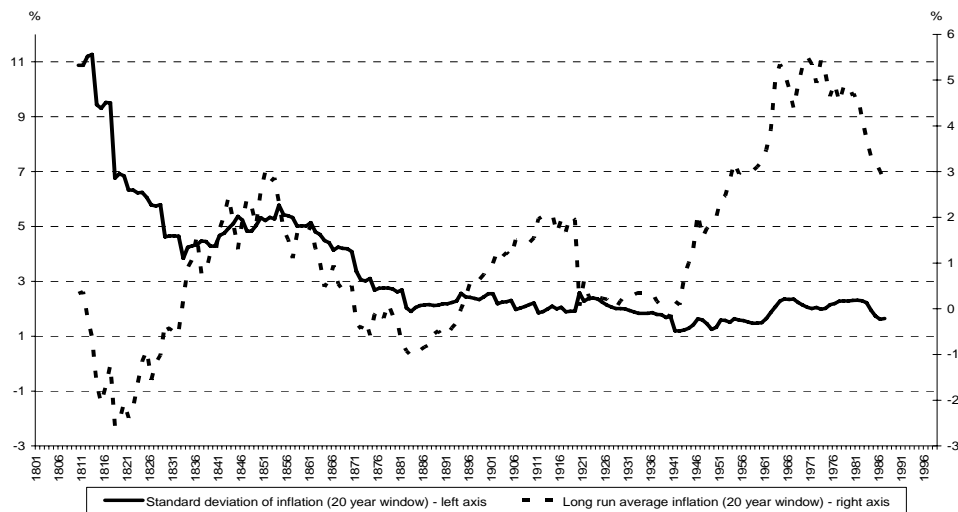
Source: OeNB.

Chart 4: Long-Run Average Inflation became Significantly Different from Zero in Austria only from the Mid 20th Century



Source: OeNB.

Chart 5: Long-Run Average Inflation and Inflation Volatility in Austria since 1800



Source: OeNB.

A second, potentially even more interesting observation relates to the often quoted stylized fact of a positive relation between the level and the volatility of inflation which is found when comparing across countries. According to the chart below, when considering very long spans of time, the Austrian data reflect opposing trends in the first and second moment of the series. If we concentrate on shorter time spans, a positive correlation between the two series was observable during much of the 19th century, but broke down in the first part of the 20th century. After World War II, the positive correlation reappears.

8. Summary and Conclusions

This article has argued that empirical studies of price stickiness and inflation persistence can be useful for monetary policy design and implementation, for designing structural policies aimed at smoother shock absorption by euro area economies and for achieving better informed inflation and growth forecasts. In the context of the euro area Inflation Persistence Network, the OeNB conducted studies at the macro as well as the micro levels to investigate price-setting behaviour both at the consumer and producer price levels. A study on consumers’ formation of inflation perceptions supplemented this work.

The distinction between price stickiness and inflation persistence was highlighted, as were important assumptions underlying any estimation of inflation

persistence. Various sources of inflation persistence were identified on the basis of an illustrative hybrid New Keynesian Phillips Curve.

The article summarized a number of policy relevant findings for the euro area, as found by the IPN: Inflation persistence in the euro area has fallen over the 1990s and is moderate – similar to the United States. Its sources are mostly extrinsic, i.e. due to behaviour of cost factors, such as wages and other input prices. Prices were shown to be stickier in the euro area than in the U.S.A., i.e. they respond less to changes in marginal cost or the output gap. Importantly, there is no evidence of general downward consumer price rigidity in the euro area, with the exception of the service sector. Heterogeneity in the frequency of consumer price changes across products is empirically more relevant than heterogeneity across countries. Implicit contracts, explicit contracts, cost-based pricing and coordination failure are, according to enterprises’ own assessment, important explanatory factors for firms’ pricing behaviour best. By contrast, menu costs, information costs and pricing thresholds appear to be less relevant for not changing prices. Cost shocks were considered more important for price increases, while weakening demand or stiffer competition were quoted as being more important for price reductions. Finally, input prices were shown to drive producer price flexibility. Thus, in branches with high labour input prices are stickier, while branches with a high raw material input witness more frequent price adjustments.

The article argued further that “perceived inflation” is a phenomenon to be taken seriously by monetary policy makers for two reasons: First, public satisfaction or discontent with the central bank’s performance hinges on perceptions, rather than “facts”, about its ability and credibility to maintain price stability. Second, inflation expectations are likely to be influenced by perceived, rather than official current and past inflation; inflation perceptions are thus also likely to influence wages and actual inflation as well as sacrifice ratios. The psychology of perceived inflation is thus crucial for forecasting, for the design of a monetary policy strategy and for the ongoing conduct of monetary policy. It should feed into the central bank’s communication with the public and motivate central educational activities.

A final look at the past 200 years of inflation in Austria showed quite extreme developments, ranging from two periods of hyperinflation to protracted periods of negative inflation rates. Interestingly, the only period when inflation became persistently and significantly different from zero was from the 1960s of the 20th century (leaving aside the two periods of hyperinflation after WW I and II). We could not generally confirm the often quoted stylized fact of a positive relation between the level and the volatility of inflation, which is found in cross-country studies, for the very long run dynamics of Austrian inflation. Further studies will have to be conducted to refine these results using more powerful econometric techniques.

References

- Álvarez, L.J., Burriel, P. and I. Hernando (2005a), Price setting behaviour in Spain: evidence from micro PPI data, ECB Working Paper No. 522.
- Álvarez, L.J., Dhyne E., Hoerberichts M., Kwapil C., Le Bihan H., Lünemann P., Martins F., Sabbatini R., Stahl H., Vermeulen P. and J. Vilmunen (2005b), Sticky prices in the euro area: evidence from individual data, paper presented at the 2005 Annual Congress of the European Economic Association.
- Angeloni, I., Aucremanne L. and M. Ciccarelli (2005a), Price setting and inflation persistence: did EMU matter?, mimeo.
- Angeloni, I., Aucremanne, L., Ehrmann, M., Galí, J., Levin, A. and F. Smets (2005b), New evidence on inflation persistence and price stickiness in the euro area: implications for macro models and policy, *Journal of the European Economic Association* (forthcoming).
- Bils, M. and P. Klenow (2004), Some evidence on the importance of sticky prices, *Journal of Political Economy* 112, pp. 947–985.
- Dhyne, E., Álvarez L., Le Bihan H., Veronese G., Dias D., Hoffmann J., Jonker N., Lünemann P., Rumler F. and J. Vilmunen (2005), Price setting in the euro area: some stylised facts from individual consumer price data, ECB Working Paper No 524.
- Fabiani, S., Druant M., Hernando I., Kwapil C., Landau B., Loupias C., Martins F., Mathä T., Sabbatini R., Stahl H. and A. Stokman (2005), The pricing behaviour of firms in the euro area: new survey evidence, ECB Working Paper No. 535.
- Fluch, M., and H. Stix (2005), Perceived inflation in Austria – extent, explanations, effects, in: *Monetary Policy & the Economy*, Q3/05.
- Gadzinski, G. and F. Orlandi (2004), Inflation persistence for the EU countries, the euro area and the US, ECB Working Paper No. 414.
- Galí, J., Gertler M. and D. López-Salido (2001a), European inflation dynamics, *European Economic Review*, 45(7), 1237–1270.
- Galí, J., Gertler M. and D. López-Salido (2001b), Erratum, *European Economic Review*, 47(4), 759–760.
- Levin, A.T. and J.M. Piger (2004), Is inflation persistence intrinsic in industrial economies?, ECB Working Paper No. 334.
- Lünemann, P. and T. Mathä (2004), How persistent is disaggregate inflation? An analysis across EU countries and HICP subindices, ECB Working Paper No. 415.
- O’Reilly, G. and K. Whelan (2004) Has euro-area inflation persistence changed over time? ECB Working Paper No. 335.
- Pech, H. (2002), Eine Chronologie der Geschichte des Schilling, in: Liebscher, K. (ed.), *Vom Schilling zum Euro, Festschrift Adolf Wala zum 65. Geburtstag*, Wien.

- Pressburger, S. (1966), Oesterreichische Nationalbank 1816–1966. Geschichte des österreichischen Noteninstituts, Wien.
- Robalo-Marques, C. (2004), Inflation persistence: facts or artefacts?, ECB Working Paper No. 371.
- Schubert, A. (2005), Torn between monetary and financial stability – an analysis of selected episodes of Austrian central banking history, paper presented at the European Association for Banking and Financial History Conference, “Finance and Modernisation” in Vienna in May 2005.
- Smets, F. and R. Wouters (2003), An estimated stochastic dynamic general equilibrium model of the euro area, *Journal of European Economic Association* 1(5), 1123–1175.