A level-dependence approach for assessing de-anchoring of inflation expectations: Evidence from Colombia

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Resumen:

This study introduces a methodology for evaluating the de-anchoring of inflation expectations by proposing indicators to measure deviations in short- and long-term inflation expectations from the Central Bank's target, analyzing their dependency over time using traditional and hierarchical statistical copulas, the latter incorporating the effect of the monetary policy stance. Using data from the Colombian financial market, the findings reveal that during inflationary episodes (2008–2009, 2015–2016, and 2022–2023), the dependency between short- and long-term expectations increased, indicating de-anchoring. This pattern was also observed during periods when inflation was below the target (2013 and 2020). Conversely, in years such as 2006, 2010, 2014, 2017, and 2021, and towards the end of 2023, the decrease in this dependency suggests that expectations were anchoring. Additionally, when conditioning on the monetary policy stance, it is found that periods of contractionary policy coincide with stronger negative dependence, while episodes of gradual rate reductions coincide with positive dependence. These patterns should not be interpreted as policy actions de-anchoring expectations; rather, they reflect how expectations behave during different macroeconomic conditions to which monetary policy reacts.

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anchoring episodes. These episodes arise when expectations persistently deviate from the target or when shocks simultaneously affect short-term (ST) and long-term (LT) horizons, weakening the expectations channel of monetary policy and requiring stronger interest rate adjustments at a higher economic cost. This study proposes a novel methodological approach that combines two strategies: quantifying deviations of short- and long-term expectations from the target and estimating the dependence between them. Additionally, it examines how this dependence evolves under different monetary policy stances.

This analysis leverages traditional statistical copulas to capture potential non-linearities in the dependence structure and incorporates hierarchical copulas to explore how the monetary policy stance conditions the relationship between short- and long-term expectations. The use of copulas is particularly advantageous because linear measures of dependence — such as correlations or regression coefficients — are often insufficient to characterize complex interactions between variables. As discussed by Antunes (2015), two variables may exhibit zero correlation while still being strongly dependent (for instance, a random variable and its square), illustrating that correlation fails to detect non-linear co-movements.

Moreover, in environments where distributions may present heavy tails or asymmetric behavior — features frequently observed in financial data and inflation expectations — correlation may be undefined or misleading (Resnick, 2007). In contrast, copulas allow for a flexible characterization of dependence, capturing tail behavior, asymmetries, and non-linear co-movements that would be missed by linear models. The hierarchical copula structure further extends this flexibility by enabling the dependence between short- and long-term expectations to be conditioned on the monetary policy stance. This is a key contribution of the paper: hierarchical copulas allow us to answer questions that simpler methods cannot, such as whether the ST–LT dependence strengthens or weakens specifically within contractionary episodes versus expansionary phases, and whether the nature of this dependence (positive, negative, or tail-driven) changes in response to shifts in policy stance. Such conditioning would be impossible using standard copulas or traditional linear dependence measures.

It is important to emphasize that the dependence patterns identified in this study are not intended to suggest that monetary policy actions cause de-anchoring. Instead, monetary policy typically reacts endogenously to inflationary pressures. The estimated dependence should therefore be interpreted as characterizing the state of expectation anchoring during different macroeconomic environments, not as a causal effect of policy decisions.

To characterize these de-anchoring states, however, one must first obtain reliable measures of inflation expectations. Since inflation expectations are not directly observable, they must be inferred from various sources, such as surveys (Candia et al., 2024), financial market instruments (Joyce et al., 2010), or social media data analyzed using Natural Language Processing techniques (Angelico et al., 2022). These expectations reflect the perceptions, beliefs, and forecasts of households, businesses, and financial market agents regarding future price movements. In turn, they influence key economic decisions related to wages, investment, consumption, and pricing (Coibion et al., 2018). As a result, expectations serve as a crucial signal of the Central Bank's credibility and play a fundamental role in shaping short-term inflation dynamics (Mester, 2022). This study uses Forward Breakeven Inflation

(TBEIs), which takes advantage of their high frequency and allow inference of expected inflation between two points in time.

The application of the proposed methodology to Colombian data reveals that in 2006, 2010, 2014, 2017, 2018, and 2021, expectations were anchored, as reflected by the decrease in dependency between short- and long-term expectations. In contrast, during episodes of high inflation, such as those observed in 2008–2009, 2011,2015–2016, and 2022–2023, dependency increased notably, indicating de-anchoring. These findings complement those of Gamba-Santamaría et al. (2016) and Iregui-Bohórquez et al. (2021), who evaluate the anchoring of inflation expectations based on surveys, and the study by Escorcia-Arana (2017), which examines the impact of de-anchoring on monetary policy in Colombia. Additionally, when the monetary policy stance was considered, a strong negative dependence was observed during contractionary episodes, while progressive interest rate reductions correlated with positive dependency.

After this introduction, this paper is structured as follows: The second section explores the motivation for the study and addresses the relevant literature. The third section describes the methodology employed to estimate the degree of de-anchoring in inflation expectations. The fourth section presents the data to which the proposed methodology is applied. The fifth section presents and analyzes the results. Finally, the sixth section summarizes the key findings, discusses their implications, and offers the study's conclusions.