South African Reserve Bank Special Occasional Bulletin of Economic Notes

Special OBEN/24/02

South African Reserve Bank Economic Notes are typically short economic analyses initially written for internal discussion and to stimulate debate. They are written by staff members of the South African Reserve Bank or visiting fellows and are released publicly on an occasional basis.

SOUTH AFRICAN RESERVE BANK

Authorised for publication by:

Chris Loewald

August 2024

SARB Special Occasional Bulletin of Economic Notes August 2024

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Special OBEN 2402* – June 2024

A supercore inflation measure for South Africa

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Abstract

We construct a new inflation measure to monitor underlying price developments in South Africa, termed supercore inflation. Supercore inflation is made up of the components of core inflation that are responsive to general economic conditions, as measured by the output gap. Our findings reveal that demand-driven inflationary pressures, as measured by supercore inflation, are presently balanced, with inflation outcomes hovering around the target midpoint over the past year. The finding of 'balanced' demand-driven inflationary pressures is consistent with a virtually closed output gap over the past year, as indicated by the South African Reserve Bank's Quarterly Projection Model.

1. Introduction[1]

Although the South African Reserve Bank (SARB), like most other central banks, targets headline inflation as its anchor for price stability, it pays significant attention to underlying inflation to gauge the direction of headline inflation and thus the appropriate monetary policy posture. This is because headline inflation is susceptible to transitory shocks and thus can be quite volatile, with a high noise-to-signal ratio. Underlying inflation measures attempt to filter out short-run price fluctuations and depict the persistent or trend component of inflation.

The standard measure for underlying inflation commonly applied by central banks is core inflation, which eliminates seasonal fluctuations and volatile items such as food and energy prices (Johnson 1999). Various other measures of underlying inflation have been developed in the literature and include trimmed mean inflation,[2] weighted median inflation,[3] persistent and common component of inflation (PCCI)[4] and supercore inflation. Relying on multiple measures of inflation provides robustness to monetary policy setting against the uncertainty from trend

1 We would like to extend our gratitude to Susan Knox for her assistance with the data and valuable contributions to the economic note.

2 The trimmed mean considers the average inflation rate after symmetrically or asymmetrically trimming a certain percentage of the inflation distribution at both ends (Brischetto and Richards 2007).

3 The weighted median includes trimming 50% of the entire distribution on each side, and the core inflation reading would be the inflation rate of the component in the middle (Ball, et al. 2023).

4 The persistent and common component of inflation captures the underlying trend common for all goods and services in the CPI basket (Bańbura and Bobeica 2020).

inflation unobservability (Morana 2023). Presently, the SARB tracks two measures of underlying inflation – core and trimmed mean inflation – published by Statistics South Africa (Stats SA), with core inflation playing a more central role in policy discussions.

The objective of this note is to construct a new measure of underlying inflation for South Africa, namely, supercore inflation, to broaden the suite of indicators of trend inflation tracked by the SARB's Monetary Policy Committee. Supercore inflation is designed to track the price pressures that are driven primarily by economic slack, as measured by the output gap. It is that subset of core inflation whose components show high sensitivity to the business cycle. In this regard, it provides valuable insights for monetary policy, especially in distinguishing between inflationary pressures that are likely to be transient and those signalling more persistent trends.[5] To the extent that the output gap proxies the balance between aggregate demand and aggregate supply (potential output) well, inflation pressures are stronger when output is above its potential and muted otherwise.[6] Because of this ability to isolate demand-driven inflation pressures, a supercore inflation measure is directly relevant and supportive of monetary policy decision making.

To construct the supercore measure, we follow the methodology proposed by the European Central Bank (ECB) (2018) but with notable variations. The approach uses reduced-form Phillips curve specifications to test the responsiveness of the sub- components of core inflation to the output gap.

2. Data and methodology

The analysis uses the core consumer price index (CPI) data from Stats SA, disaggregated at the COICOP 3 level. The disaggregated data contains 43 indices. However, three of these, namely, other major durables for recreation and culture, services for the maintenance and repair of dwellings and package holiday services were dropped from the analysis as these indices have too few observations, leaving a total of 40 quarterly indices. These CPI indices are not seasonally adjusted, and we log- transform them to account for any exponential trend typically present in price indices. Other key data include the output gap series as estimated by the SARB's Quarterly Projection Model. The sample period is from the first quarter of 2002 to the first quarter of 2024 and is chosen to both capture the inflation targeting period and to have enough observations to apply our methodology.[7]

We construct a supercore index by selecting only those components of the core CPI basket that are sensitive to general economic conditions as proxied by the output gap. In this sense, the measure filters out components of core inflation that, as described below, are assessed to be unresponsive to business cycle fluctuations. We follow the approach by the ECB (2018), but with some departures. The methodology is implemented in three steps. First, for each of the 40 core CPI components, we estimate three Phillips curve specifications which respectively

5 See BBVA (2018).

6 Concerns regarding real-time output gap estimates for South Africa include the fact that they undergo significant revisions overtime, which may affect reliability. This is, in part, attributable to revisions in the national accounts data, including GDP (Kemp 2014).

7 The first quarter of 2024 includes the average of two months (January and February). The inflation outcome for March was not published yet at the time this model was run.

include the output gap lagged by one quarter; the output gap lagged by two quarters and the output gap lagged by one and two quarters. This is estimated using a seasonal autoregressive integrated moving average (ARIMA) model, specified under the framework ARIMA (1, 1, 1)×(1, 1, 1)$_4$. The seasonal component is added to capture any seasonality and survey effects that may be present in the data. We also estimate a benchmark ARIMA model for each of the core CPI components. ECB (2018), on the other hand, use an autoregressive process of order 1 (AR (1)) instead as their benchmark model. The four estimated equations are written as:

$$\Delta\Delta_4 y_{it} = ARIMA\ terms + \alpha_{1i} \cdot outputgap_{t-1} + \varepsilon_{it}^1 \quad (1)$$

$$\Delta\Delta_4 y_{it} = ARIMA\ terms + \beta_{1i} \cdot outputgap_{t-2} + \varepsilon_{it}^2 \quad (2)$$

$$\Delta\Delta_4 y_{it} = ARIMA\ terms + \delta_{1i} \cdot outputgap_{t-1} + \delta_{2i} \cdot outputgap_{t-2} + \varepsilon_{it}^3 \quad (3)$$

$$\Delta\Delta_4 y_{it} = ARIMA\ terms + \varepsilon_{it}^4 \quad (4)$$

where Δ and Δ_4 represent the first order non-seasonal and seasonal differencing, respectively; y_{it} is the log-transformed index level of component *i* in the core CPI basket at time *t*, and ε_{it}^j is the error term of the *j*th equation. Equation (4) serves as a benchmark to compare against equations (1), (2) and (3). The ARIMA terms are omitted for brevity.

In the second step, we perform forecasts for each of the 40 components for horizons of one to four quarters ahead. The forecasts are estimated conditional on the path of the output gap over the forecast period. Lastly, we calculate the average root mean square forecast error (ARMSFE) for each of the components of the core basket. This is done for each of the three Phillips curve equations as well as for the ARIMA benchmark model. We compare the ARMSFEs of the Phillips curve equations with the benchmark and if any one of the Phillips curve equations performs better than the benchmark, then that component is deemed sensitive to slack and is included in the supercore index.[8]

3. Estimation results and discussion

3.1. Preliminaries

Based on the above analysis, a total of 11 components in the core inflation basket make it into the supercore basket, accounting for 22.4% of the core CPI basket.[9] This means that about a quarter of the core inflation dynamics can be explained mainly by demand fluctuations. This differs somewhat from Radebe (2019) who finds that 37% of the core inflation basket is

[8] In other words, the inclusion of the output gap enhances the predictive accuracy of inflation for each item, compared to the baseline.

[9] Table A1 in Appendix A outlines the excluded components from the supercore index.

sensitive to the business cycle.[10] Table 1 gives the items included in the supercore index, and their respective weights.

The three largest components in our supercore measure are rentals, water and other services, and household content services, with weights of 21.0%, 20.8% and 15.2%, respectively (see Table 1). That water and other services (this includes assessment rates, refuse collection, and sewerage) and tertiary education are included in supercore is rather surprising as these are administered prices.[11] Equally, there are items such as clothing, footwear, purchase of vehicles, household content goods, and hotels that, intuitively, one would expect to show sensitivity to the business cycle that, nevertheless, are excluded from supercore. Radebe (2019) also found these items to be unresponsive to economic slack (i.e. acyclical).[12] The statistically insignificant results may reflect a relatively low elasticity of demand, or factors related to market structures (ECB 2014).

Table 1: Supercore components and weights

Component	Weight in headline	Weight in core	Weight in supercore
Goods			
Other recreational items	0.66	0.89	4.0
Recreational equipment	0.6	0.81	3.6
Spare parts and accessories	0.43	0.58	2.6
Telephone equipment	0.19	0.26	1.1
Services			
Actual rentals for housing	3.5	4.70	21.0
Water & other services	3.46	4.65	20.8
Household content services	2.53	3.40	15.2
Catering services	2.2	2.96	13.2
Other miscellaneous services	1.29	1.73	7.7
Tertiary education	1.05	1.41	6.3
Personal vehicle operation	0.76	1.02	4.6
Total	**16.67**	**22.4**	**100**

Source: Stats SA and authors' own calculations.

[10] Radebe (2019) used CPI data disaggregated at the COICIOP 2 level, the level of disaggregation could explain the difference in the authors findings compared to ours. When we ran the model using the COICOP 2 level of disaggregation, the supercore basket accounted for 40.0% of the core basket which is more in line with Radebe (2019). Her Phillips curve specification differs greatly from our own. She includes inflation expectations and only the first lag of the output gap. The model follows AR(1) process whereas we use an ARIMA model. Moreover, a component from the core CPI basket is considered procyclical if the coefficient is positive and statistically significant. We employ a three-step process that includes calculating the ARMSFEs to determine which components to include in the supercore index.

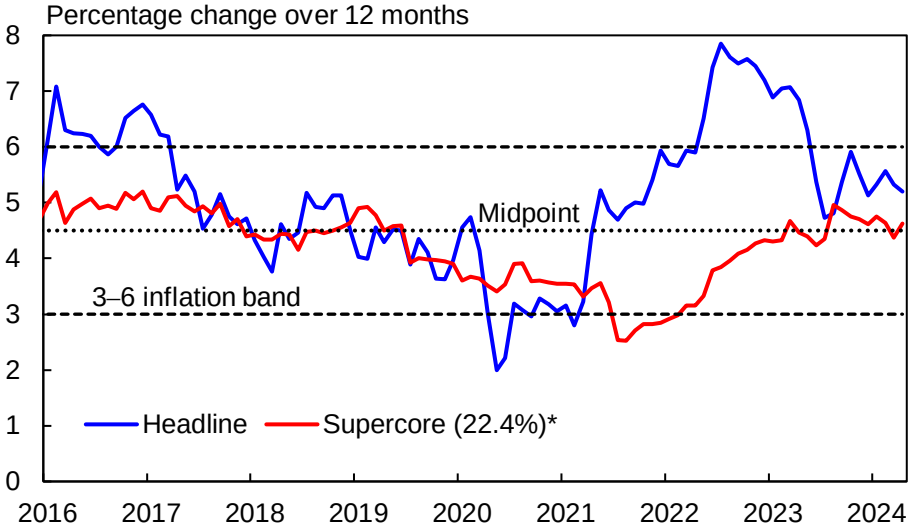
[11] We ran the model considering only the pre-COVID-19 sample period (from the first quarter of 2002 to the fourth quarter of 2019). We find that administered prices are excluded from the supercore index. This suggests that the COVID-19 pandemic may have resulted in a correlation between the business cycle and some administered prices.

[12] As suggested by the reviewer, the non-sensitivity of some of these components could be because they only respond to slack with a lag of more than two quarters. Our model only considers the first and second lags.

3.2. The supercore measure

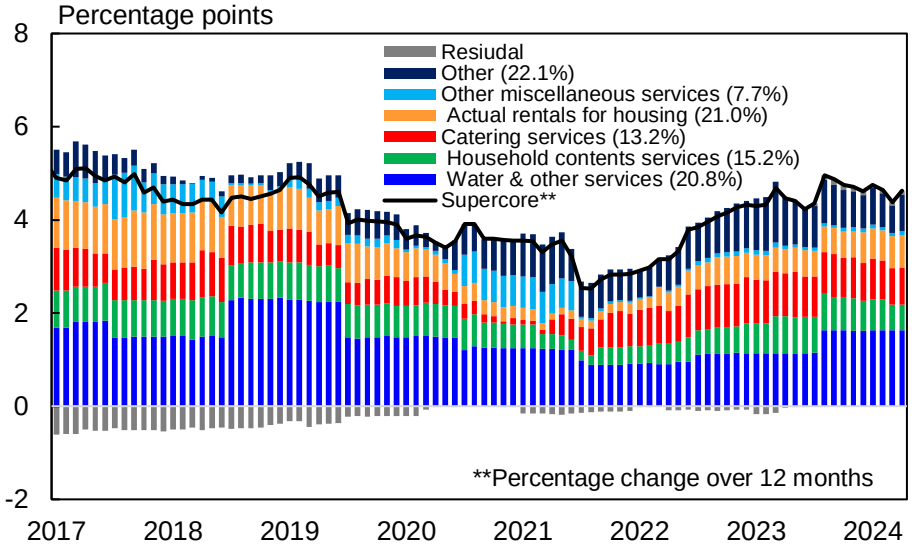
Figure 1 depicts supercore inflation along with headline inflation. As one would expect, supercore inflation is less volatile than headline inflation. Supercore inflation remained close to the midpoint of the target band between 2016 and 2019, but trended lower from 2019, briefly falling below the lower threshold of the target band before gradually rising from 2021. The rise in supercore inflation since 2021 has been broad- based, with actual rentals, catering services and household content services adding materially to the upwards momentum (Figure 2). Over the past year, supercore inflation has hovered around the midpoint of the target band.

Figure 1: Supercore inflation



* Weight in core basket in brackets
Sources: Stats SA and SARB

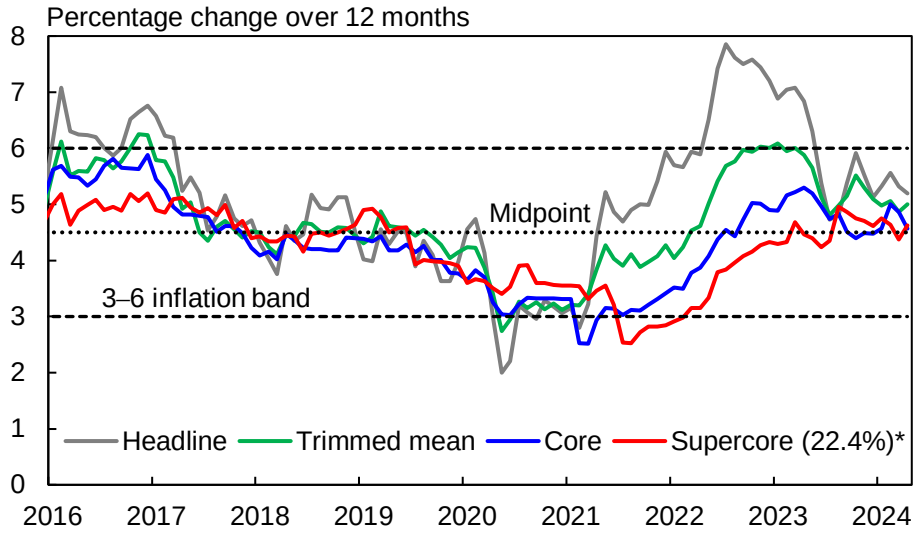
Figure 2: Contributions to supercore inflation*



* Weight in supercore basket in brackets
Sources: Stats SA and SARB

Between 2017 and 2020 headline inflation and the three measures of underlying inflation (core, trimmed mean and supercore inflation) tracked each other closely and hovered around the midpoint of the inflation target band. The convergence to the 4.5% midpoint over this period coincided with the shift in the SARB's communication to emphasise the midpoint of the 3-6% target band. The COVID-19 shock in early 2020 resulted in a sharp deceleration in inflation across all measures, but with some delay in supercore, which only troughed in July 2021.[13] As the economy re-opened following the COVID-19 lockdowns and economic activity gained momentum, inflation picked up across all measures but the gap between them widened, with headline and trimmed mean inflation quick off the blocks while supercore rose only gradually.

Figure 3: Measures of underlying inflation



* Weight in core basket in brackets
Sources: Stats SA and SARB

The sluggish rise in supercore inflation in the post-pandemic period suggests that inflationary pressures over this period were less about demand-pull and more about cost-push factors or relative price movements. Indeed, early in the recovery inflationary pressures largely emanated from the surge in global food and oil prices on account of recovering global demand amid the COVID-19-induced supply bottlenecks. These effects were later exacerbated by the Russia/Ukraine conflict in 2022, which impacted on agricultural commodities, agricultural input costs and crude oil prices. Further supply-side pressures emanated from a depreciated rand, along with other idiosyncratic factors such as load-shedding and the outbreak of animal diseases.

The trajectory of supercore inflation since the pandemic is best understood by reference to the dynamics of the output gap during this period. The output gap widened to -3.5% in 2020 and remained elevated at -1.9% in 2021, implying demand weakness and thus substantial disinflationary pressures. Supercore inflation rose as the output gap closed (demand strengthened) through the recovery, in part benefitting from the record low interest rates during

[13] Headline and trimmed mean inflation troughed in May 2020, while core inflation bottomed nearly a year later in February 2021.

this period. Supercore inflation now hovers around the target midpoint, indicating neither inflationary nor deflationary demand pressures.

4. Conclusion

In this economic note we construct a new measure of trend inflation for South Africa, named supercore inflation, to broaden the suite of indicators used by the SARB to monitor underlying price developments. The supercore basket is made up of components that are responsive to general economic conditions as measured by the output gap. Broadening the suite of measures for assessing underlying price pressures enhances robustness and confidence of correctly pinning down the persistent inflationary dynamics given the uncertainty around any single such measure, which is crucial for the formulation and calibration of monetary policy by the SARB. Our findings reveal that demand-driven inflationary pressures are presently more balanced, with supercore inflation hovering around the target midpoint in recent months.

'Official' measures – core inflation and trimmed mean inflation – show slightly more elevated inflation pressures. The divergence between core and trimmed mean inflation on the one hand and supercore inflation on the other reflects supply-side price pressures such as cost-push factors and shifts in relative prices. Indeed, the 'balanced' inflationary pressures finding for supercore inflation is consistent with the SARB's view of the output gap – which is estimated to be neutral/closed since the past year.

References

Ball, L M, Carvalho, C, Evans, C and Ricci, L A. 2023. 'Weighted Median Inflation Around the World: A Measure of Core Inflation'. *International Monetary Fund Working Paper No. 2023/044,* February. Washington D.C.: International Monetary Fund.

Bańbura, M, Bobeica, E, Bodnar, K, Fagandini, B, Healey, P and Paredes, J. 2023. 'Underlying inflation measures: an analytical guide for the euro area.' *European Central Bank Economic Bulletin, Issue 5/2023*, August. Frankfurt: European Central Bank.

Bańbura, M. and Bobeica, E. 2020. 'PCCI: A data-rich measure of underlying inflation in the euro area' *European Central Bank Statistics Paper No. 38*, October. Frankfurt: European Central Bank.

BBVA. 2018. A measure of supercore inflation for the eurozone. BBVA Research. Madrid: BBVA.

Brischetto, A and Richards, A. 2007. 'The performance of trimmed mean measures of underlying inflation'. Updated and revised version of Reserve Bank of Australia Discussion Paper 2006-10, MaySydney: Reserve Bank of Australia.

Clark, T E, Gordan, V M and Zamen, S. 2023. 'Forecasting core inflation and its goods, housing and supercore components'. *Federal Reserve Bank of Cleveland Working Paper Series, No. 23-24*, December. Cleveland: Federal Reserve Bank of Cleveland.

European Central Bank. 2018. 'Box 2 The Supercore measure of underlying inflation'. *European Central Bank Economic Bulletin, Issue 4 2018*, June. Frankfurt: European Central Bank.

European Central Bank. 2014. 'Box 5 The responsiveness of HICP Items to changes in Economic Slack'. *Monthly Bulletin*, September. Frankfurt: European Central Bank.

Johnson, M. 1999. 'Core Inflation: A measure of inflation for policy purposes. Bank for International Settlements proceedings of the workshop of central bank model builders. Basel: Bank for International Settlements.

Kemp, H. 2014. 'Measuring potential output for the South African economy: embedding information about the financial cycle'. *Stellenbosch University Economic Working Paper No. 03/14*. Stellenbosch: Stellenbosch University.

Morana, C. 2023. 'Euro area inflation and a new measure of core inflation'. *Research in Globalisation.* 7:100159.

Radebe, T. 2019. 'South Africa's disinflation: A cyclical phenomenon?.*South African Reserve Bank Occasional Bulletin of Economic Notes, OBEN/19/02*, August. Pretoria: South African Reserve Bank.

Appendix

A Included and excluded components in supercore

Table A1: Core CPI

Core CPI component	Included or excluded in the supercore measure
Goods	
Alcoholic beverages	No
Tobacco	No
Clothing	No
Footwear	No
Telephone equipment	Yes
Medical products	No
Furnishings	No
Textiles	No
Glassware, tableware, and household utensils	No
Household appliances	No
Tools and equipment for house and garden	No
Liquid fuels	No
Maintenance and repair	No
Personal care products	No
Personal effects	No
Newspapers, books, and stationery	No
Other recreational items	Yes
Recreational equipment	Yes
Vehicle spare parts and accessories	Yes
Purchase of vehicles	No
Services	
Postal services	No
Telephone services	No
Primary education	No
Secondary education	No
Tertiary education	Yes
Hospital	No
Outpatient	No
Household content services	Yes
Actual rentals	Yes
Owners' equivalent rent	No
Water and other services	Yes
Financial services	No
Insurance	No
Other miscellaneous services	Yes
Personal care services	No
Cultural services	No
Accommodation services	No
Catering services	Yes
Personal vehicle operation	Yes
Public transport	No

Sources: Stats SA and SARB.