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Enquiries
Head: Economic Research Department
South African Reserve Bank
P O Box 427
Pretoria 0001

Tel. no.: +27 12 313-3911
0861 12 SARB (0861 12 7272)

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South Africa's disinflation: A cyclical phenomenon?

Thulisile Radebe[1]

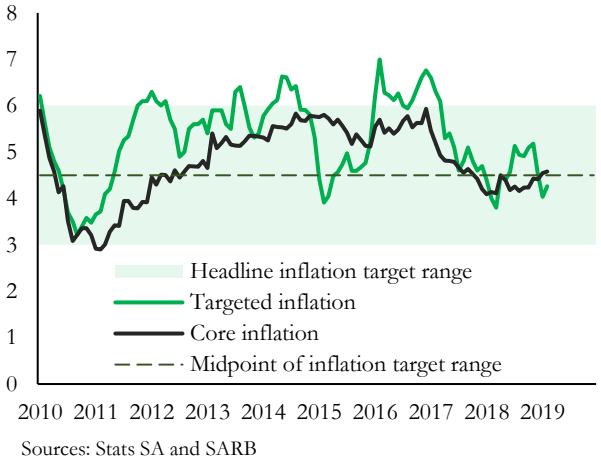
Abstract

South Africa's recent disinflation is sometimes attributed to weak demand. To test this claim, this note divides the components of the consumer price index into demand-sensitive and demand-insensitive portions. This classification shows the majority (about 80%) of lower inflation is coming from prices that do not typically follow the business cycle, with the balance coming from demand-sensitive items. Weak demand therefore appears to be contributing to lower inflation, but it is not a primary driver.

Introduction

South Africa has enjoyed inflation near the midpoint of the 3-6% target band since about mid-2017. This sustained period of lower inflation is unusual; inflation for the 2010–2016 period averaged 5.6%. One explanation for the slower pace of inflation is weak demand. For example, National Treasury's 2017 MTBPS (which projected an average fiscal deficit of 4.6% over the three year policy horizon and debt reaching 60% of GDP by 2021/22) states "core inflation, which excludes price-volatile items such as food, fuel and electricity, fell from 5.9 per cent in December 2016 to 4.6 per cent in August 2017, *reflecting weak domestic demand*."[2] The evidence presented in this note shows that the business cycle has played a secondary role in South Africa's disinflation. While there has been a moderation in inflation for demand-sensitive components of the consumer price index, most of the disinflation observed is traceable to CPI components that are acyclical, meaning they tend not to follow business cycle developments.

Headline and core inflation (%)



Sources: Stats SA and SARB

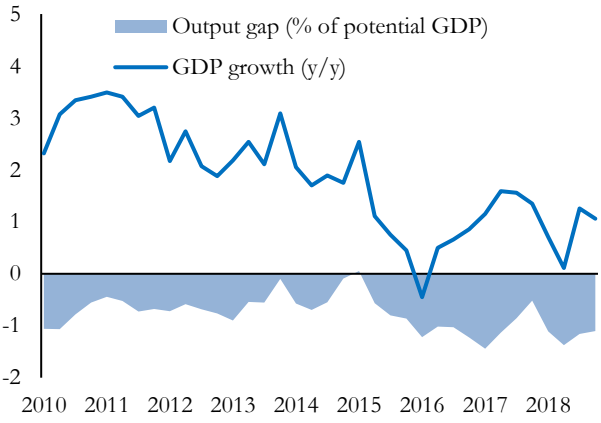
Inflation and the business cycle

[1] The author would like to thank David Fowkes, Theresa Alton, Jean-Francois Mercier, Witness Simbangavi, Osie van der Merwe, Iaan Venter, and seminar attendees for useful comments and access to data.

[2] See Medium Term Budget Policy Statement (Oct 2017), National Treasury. See also "Moderate inflation is largely the result of subdued demand, sky-high unemployment and an economy that is clearly on the rocks"; "Domestic inflationary pressures have moderated markedly since 2016 in step with the longest downward phase of the business cycle after World War II".

According to the frequently-cited Phillips curve, during boom periods demand is high relative to supply and prices tend to rise; in bust periods, businesses find it more difficult to raise prices and inflation is low. There has been a considerable amount of research into whether or not the business cycle is a relevant determinant of South Africa's inflation rate. Kabundi et al (2016)[3] found that the relationship between headline inflation and the output gap – the SARB's preferred measure of slack – is asymmetric, with the relationship stronger during times of overheating. Botha and Steenkamp (2019)[4] argue that the output gap matters, but the persistence of previous inflation and expectations of future inflation play a more important role in determining future inflation. Similarly, Fedderke and Liu (2016)[5] contend that the role of the Phillips curve is auxiliary, with unit labour costs the single most robust covariate of inflation. This note contributes to this literature.

Economic performance (%)



Sources: Stats SA and SARB

Cyclical components of inflation

Following the methodology developed by Mahedy and Shapiro (2017)[6] at the Federal Reserve Bank of San Francisco, we disaggregate core inflation into a range of narrower expenditure categories, such as housing, clothing, and health care. To ensure we capture several upward and downward phases of the business cycle, we use inflation rates from 1970 onwards. The disadvantage of doing so is losing out on the rich detail behind some subcategories such as owners' equivalent rent, rentals and utilities, which are only available from 2008. However, relying only on data from 2008 onwards would leave us with little variation in demand.

The Mahedy-Shapiro method calculates Phillips Curves by regressing each inflation component against the unemployment gap. We amend this specification to use the QPM output gap estimates instead. Of course, the output gap itself is an unobservable measure, and both its size and the techniques used to estimate it have been subject to debate.[7] Nonetheless, this is an important input into the policy process. Botha et al (2019)[8] have also shown that the current QPM measure performs better than other measures at slack at forecasting inflation over the one year horizon (though all measures used were deemed inadequate). While we believe this is the best available measure of slack for the South African economy, an exercise that tests an alternative specification is available later in this paper.[9]

[3] A Kabundi, E Schaling and M Some (May 2016), 'Estimating a time-varying Phillips curve for South Africa', WP/16/05, *South African Reserve Bank*.
[4] B Botha and D Steenkamp (Feb 2019), 'Decomposing the South African Phillips curve', EN/19/06, *South African Reserve Bank*.
[5] J Fedderke and Y Liu (May 2016), 'Inflation in South Africa: an assessment of alternative inflation models', WP/16/03, *South African Reserve Bank*.
[6] See T Mahedy and A Shapiro (Nov 2017), 'What's down with inflation?' Economic Letter 2017-35, *Federal Reserve Bank of San Francisco*.
[7] For example, see R Brooks and G Basile (May 2019), 'Campaign against Nonsense Output Gaps', *Institute of International Finance*.
[8] See B Botha, K Mojapelo and D Steenkamp (May 2019), 'Which is our best output gap? Comparing our real-time and ex-post output gap estimates, EN/19/10, *South African Reserve Bank*.
[9] We note that the QPM is only calibrated from 1987 onwards, and estimates of the output gap in the preceding period may be subject to an endogeneity problem. To mitigate against potential problems, we compared the results to outcomes that use an output gap derived from the Hodrick–Prescott filter for the period 1970–1986. Doing so did not change the results in any meaningful way, so we have taken the QPM estimate as is from 1970-date.

Finally, as is standard in most Phillips curve literature, the methodology controls for the persistence of previous inflation, as well as expectations of future inflation.[10] For the purposes of this note, the methodology does not explicitly account for other drivers of inflation, such as the exchange rate, commodity prices, or unit labour costs. Doing so would require a more elaborate principle-components approach for explaining inflation in each of the 20 inflation categories. In order to mitigate potential autocorrelation and heteroscedasticity in the error terms due to the omission of these variables, we exploit the 4-lag Newey-West estimator. The resulting model is specified as follows:

$$\pi_{i,t} = \alpha_i + \beta_i y_{t-1} + \delta_i \pi_t^* + (1 - \delta_i)\pi_{i,t-1} + \varepsilon_t$$

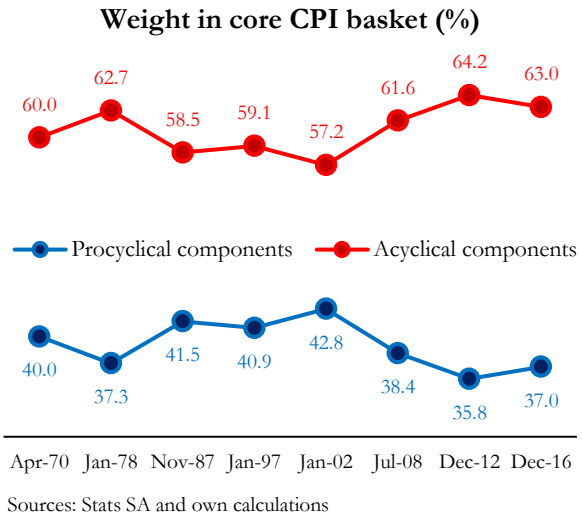
Where

$\pi_{i,t}$ is the quarterly inflation rate for sector i;
y_t is the output gap;
π_t^* is the expected trend level of inflation; and
α_i is a constant.

In order to determine which categories are sensitive to fluctuations in the business cycle, we test the co-efficient on the output gap. If this co-efficient is positive and statistically significant, we call this component *procyclical* – general economic conditions drive inflation in this component. If it fails this test, then it is *acyclical*, and inflation is largely determined by other, more structural, factors.

The Mahedy-Shapiro method uses a strict definition for determining cyclicality, requiring statistical significance at the 1% level required over the 1985-2007 period. It is clear to us that the output gap should be statistically significant, but it is not obvious why to the 1% level (as opposed to, say, 10%). South African data also has various structural breaks in its history – including the democratic transition, introduction of inflation targeting, and the global financial crisis – and what may be cyclical during one period may not hold during another period. We therefore opt for a somewhat looser definition, in order to capture categories on the margin. Doing so flatters the procyclical inflation basket. See the appendix for more detail.

The results of the analysis described above show that about one third (37%) of core inflation is sensitive to the business cycle. Price formation for the rest of South Africa's 'underlying' inflation basket is independent of the cycle, responding instead to other influences (such as the exchange rate, wage indexation, and industry-specific factors). The exact magnitudes of these weights have varied over time, in line with Stats SA's periodic reweighting exercises. Nevertheless, acyclical components tend to dominate the core CPI basket over the full period under review. It is clear that South Africa's core inflation is more sensitive to factors beyond the business cycle.[11]



Sources: Stats SA and own calculations

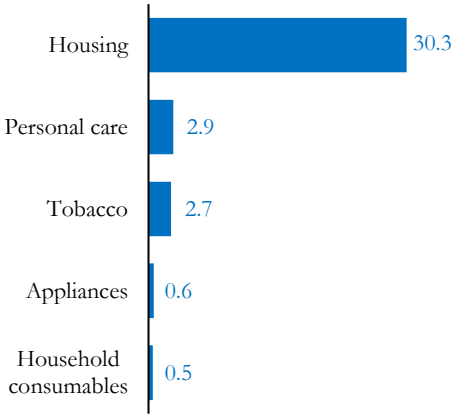
Within the cyclical basket, housing is the most important factor, accounting for more than four-fifths of the demand-sensitive basket. The result is intuitive: a slowdown in the economy should dampen incomes,

[10] Because inflation expectations in South Africa are largely backward looking, but surveys of expectations are not available over the full time-span, we use trend headline inflation as a proxy for expectations using the HP filter.
[11] This appears to be in line with international experiences: in the US, 58% of the core PCE basket is explained by acyclical components.

and because properties are non-tradeable goods, the effects of lower affordability directly impact the property market through prices. (Indeed, the correlation between real GDP growth and house price inflation is 0.58).[12]

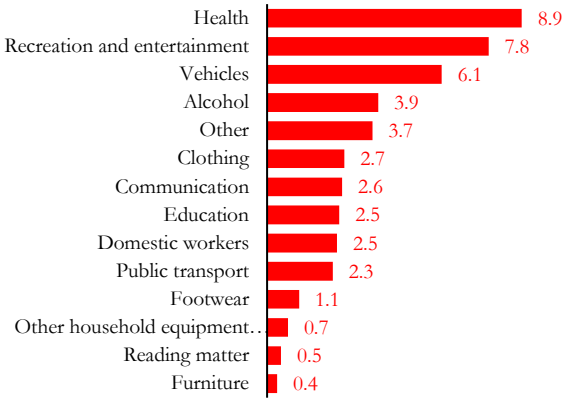
The acyclical basket is more diverse; its three largest components are health, recreational activities, and vehicles. These items tend to respond to changes beyond the business cycle. Some items, such as healthcare and funerals, appear to be demand-inelastic. Other items, such as vehicles and public transport, are extremely sensitive to changes in the exchange rate and international oil prices, and the business cycle is therefore a more minor influence. Still others, such as domestic worker wages, are more affected by expectations and wage indexation. Price determinations by government, such as in education (#feesmustfall) often have political – not economic – considerations embedded into them. Productivity gains in some items, such as communication, mean that prices continue to decline through both boom and bust periods. These factors are more structural in nature and are therefore independent of demand fluctuations.

Procyclical components:
Dec.16 weight in core CPI basket (%)



Source: Stats SA and own calculations

Acyclical components:
Dec.16 weight in core CPI basket (%)

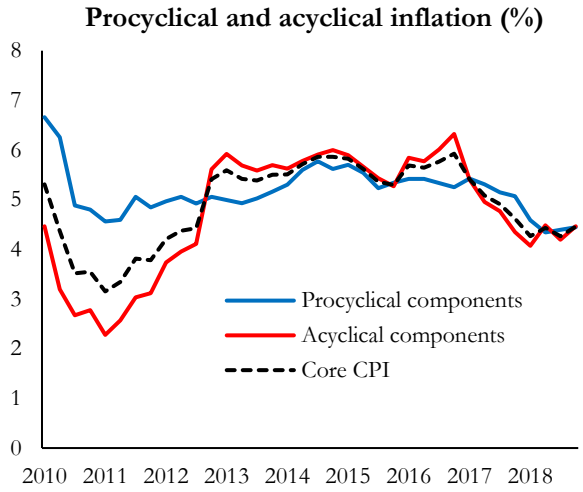


Source: Stats SA and own calculations

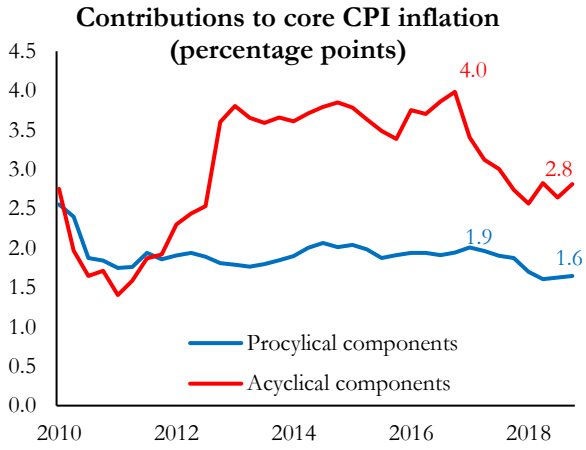
Recent disinflation

Over the 2013–16 period, the cyclical and a cyclical core inflation measures both tracked the upper-end of the inflation target range, with a cyclical inflation slightly more volatile than procyclical inflation. Both rates have since moderated from these high levels: for the final quarter of 2018, procyclical inflation was 4.4%, while a cyclical inflation was 4.5%. The timing of the disinflation varied, however: procyclical inflation peaked as early as 2014q3 at 5.8% and has been trending steadily lower. The acyclical disinflation has been more rapid: inflation peaked in the final quarter of 2016 at 6.3% and within a year reached 4.6%. Given its substantial weight in the overall core basket, the collapse in a cyclical inflation precipitated disinflation in overall core; the decline in a cyclical inflation explains about 80% of the total decline in core inflation between 2016q4–18q4.

[12] FNB house price index deflated by headline CPI over the 2001–19 period. For more detail, see JF Mercier (May 2016), 'South African property prices – about fair value?', EN/16/02, *South African Reserve Bank*.



Sources: Stats SA & own calculations

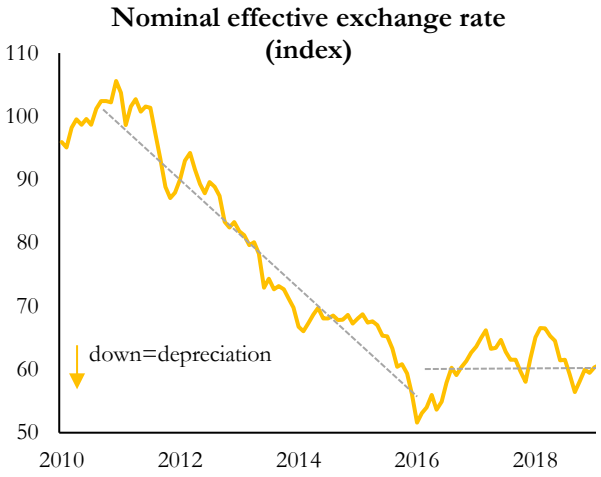


Sources: Stats SA & own calcuations

There are various plausible explanations for the disinflation of acyclical components. Janse van Rensburg and Alton (2017)[13] argue that the stabilisation of the exchange rate (after a five year depreciation trend) has lowered the cost of imported goods, and was the main determinant of core disinflation from its 2016q4 peak. Some of this stabilisation is attributable to monetary policy. Fowkes et al (2018)[14] show that agents have noticed the moderation in prices and have internalised the SARB's commitment to maintain them at these levels. Accordingly, surveyed inflation expectations have begun to moderate: for instance, two-year ahead expectations are now 5.3%, down from 6.0% 2017q1. It is likely that the temporary factors that warranted the disinflation from late 2016 have now been locked in for a sustained period due to lower expectations. An argument that attributes the disinflation exclusively to the output gap misses the point that the output gap has been stubbornly wide for about a decade while having marginal effects on inflation. It is only through the stabilisation of the exchange rate, together with an expectation that inflation will remain lower for longer, that actual inflation has begun to stick closer to the midpoint of the inflation target range.

[13] See T Janse van Rensburg and T Alton (July 2017) 'Getting to the core of it: explaining the slowdown in core inflation', *South African Reserve Bank*.

[14] For an exercise that details the role of moderating inflation expectations on actual inflation outcomes, see D Fowkes, T Janse van Rensburg and T Alton (June 2018), 'Inflation expectations and the outlook for services prices', EN/18/19, *South African Reserve Bank*.



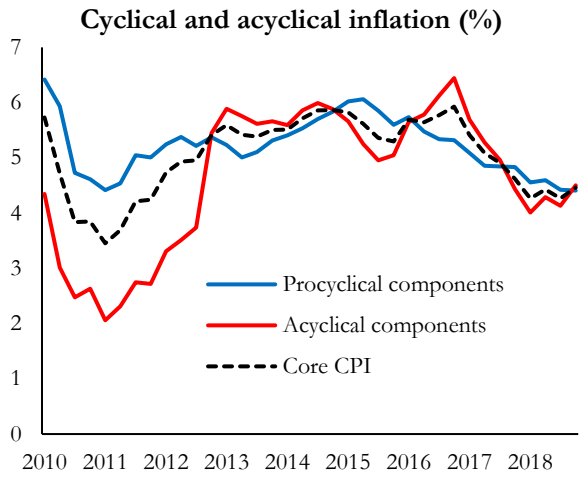
Source: SARB

Source: BER

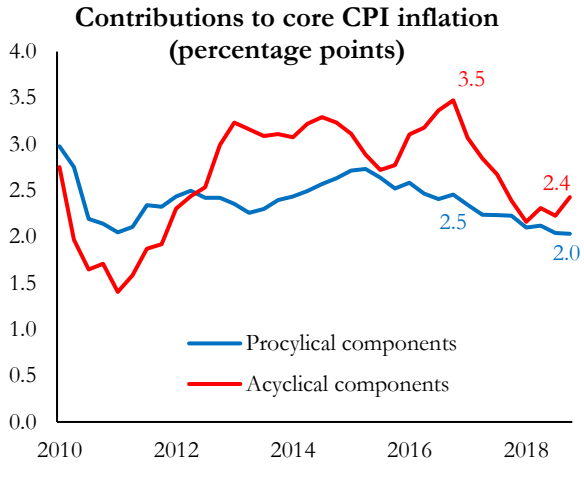
Model extensions and further research

The analysis described above is an extension of the Mahedy-Shapiro methodology to the South African landscape. As a test for robustness for the argument set out above, we extend the model to account for two additional factors. First, in order to capture some variances in defining the business cycle, we also take into account the various upside and downward phases of the business cycle described in the SARB's *Quarterly Bulletin*.[15] The use of phases helps to deal with issues surrounding the timing of the turning point of the cycle (one example is during the 2010-13 period, where the economy still had a negative output gap, but was in the upward phase). Separately, we also isolate the effect of the exchange rate, given its role in explaining South Africa's disinflation since 2016. The difference in results between the original Mahedy-Shapiro methodology and these iterations of the model are marginal, with only two items – alcohol and clothing – moving from the acyclical to the procyclical basket. In this case, the difference between the pro- and acyclical basket narrows, with the procyclical basket now accounting for about 46% of the overall core CPI basket. Here, procyclical inflation peaks in 2015 and steadily declines towards the midpoint, while the more volatile a cyclical basket rapidly disinflates from its 2016q4 peak to current levels. This corroborates the argument set out above: some of the disinflation has been due to procyclical components, but most – especially since 2016q4 – is due to acyclical factors

[15] The classification of upward and downward phases are as of the June 2019 publication. See "Quarterly Bulletin" (June 2019), no. 292, pg. S-195, *South African Reserve Bank*.



Sources: Stats SA & own calculations



Sources: Stats SA & own calcuations

Disaggregating inflation into procyclical and acyclical baskets provides a useful reference for identifying the role of demand in previous inflation outcomes, as well as the potential risks to the outlook. There are, however, further issues to consider that are beyond the scope of this paper.

First, while this paper captures some of the compositional changes of the inflation subcomponents (for example, a large shift of the basket from medical services to health insurance), it does not explicitly capture issues related to a change in the methodology for measuring price changes in specific subcomponents (for example, extending owners' equivalent rent beyond simply assessed mortgage costs).

Secondly, as mentioned above, the depth of data available for the period under review limits this analysis. For example, the 'recreation and entertainment' component is acyclical; however, some subcomponents – such as restaurants and hotels – may potentially be procyclical. This is possible if the weight of other acyclical subcomponents (such as recreational equipment, package holidays, lotto tickets and TV licences) is larger than procyclical subcomponents. In this case, the full weight of 'recreation and entertainment' is included in the acyclical basket, which may have an exaggerating effect. Without access to a richer dataset over an extended period, it is difficult to judge what proportion of these components to include in the procyclical and acyclical baskets. The same is true for other large components such as 'housing'.

Thirdly, this methodology does not capture the heterogeneity of supply-side shocks for various sectors over time, nor does it take into account various cyclical patterns in each spending category. While it ensures that it captures as many business cycles in South Africa as possible, an Error Correction Model may be useful in deducing the short- and long-run relationship between the output gap and each spending category.

Finally, the lived experience for South Africans is the headline inflation rate, not the core rate explored above. Applying the Mahedy-Shapiro method to food and energy subcomponents gives surprising results, with grains and fuel prices largely procyclical. This finding contradicts the common notion that these factors do not respond to the business cycle but rather industry-specific shocks, such as droughts or advancements in fracking technologies. However, this may simply be due to omitting controls for some variables in our model specification (such as the foreign output gap and global commodity prices), as discussed above.

Conclusion

While weak demand has made some contribution to lower inflation in recent years, it has not been the main driver of disinflation: other factors have played a larger role. This finding appears to be in line with the literature surrounding price formation in South Africa, and the minor role excessive slack has played in inflation outcomes. For policy, this implies lower inflation was not achieved through a contractionary interest rate policy. Indeed, the SARB's repo rate adjusted for inflation remained accommodative throughout the post-crisis period, even as growth disappointed.

Appendix

In order to define the cyclicality of each spending category, the Mahedy-Shapiro method requires that the co-efficient on the unemployment gap, β, is positive and statistically significant to the 1% level for it to be procyclical. If it fails to meet this condition, it is considered acyclical.[16] This classification is quite strict, and we've opted to use a more flexible definition. We thus define procyclical and acyclical inflation as follows:

Let β be the co-efficient on the output gap for each spending category, and ϱ be the p-value of β (this is used to calculate the statistical significance of β).

If:

$\beta > 0$	and	$\varrho < 1\%$	then we call it	'strongly procyclical';
$\beta > 0$	"	$1\% < \varrho < 10\%$	"	'moderately procyclical';
$\beta > 0$	"	$10\% < \varrho < 20\%$	"	'weakly procyclical';
$\beta \in \mathbb{R}$	"	$\varrho > 20\%$	"	'acyclical';
$\beta < 0$	"	$10\% < \varrho < 20\%$	"	'weakly countercyclical';
$\beta < 0$	"	$1\% < \varrho < 10\%$	"	'moderately countercyclical';
$\beta < 0$	and	$\varrho < 1\%$	then we call it	'strongly countercyclical'.

The Mahedy-Shapiro method runs each regression over the 1985-2007 period. Given several structural breaks in the South African economy, we run the regressions over various time-horizons, to test if the determination of cyclicality changes depending on these time-frames. In some cases they do: for example, the 'personal care' subcomponent drifts from 'strong procyclical' to 'moderate procyclical', before becoming 'strong procyclical' again. Here, it is clear that the output gap plays a role and we categorise personal care as 'procyclical'. There are very few cases where there are extreme moves from one categorisation to the other – the only extreme move is in the 'alcohol' component, which moves from 'strong procyclical' to 'acyclical'. In this case, we've categorised it as 'acyclical' – the 1971-86 results drive the 'strongly procyclical' result, and it is inconsistent with the rest of the period.

The final verdict on cyclicality are thus highlighted below. The 'final judgement' column is used in the analysis of the note.

[16] For the technical details behind Mahedy and Shapiro (2017), see Cyclical and Acyclical Core PCE inflation, *Federal Reserve Bank of San Francisco*.

Summary table					
	Full sample *1971-2018*	**1987 calibration** *1987-2018*	**Post democracy** *1994-2018*	**IT period** *2000-18*	**Final judgement**
Alcohol	Strong Procyclical	Weak Procyclical	Acyclical	Acyclical	Acyclical
Tobacco	Strong Procyclical	Moderate procyclical	Moderate procyclical	Strong Procyclical	Procyclical
Clothing	Moderate procyclical	Acyclical	Weak Procyclical	Weak Procyclical	Acyclical
Footwear	Acyclical	Acyclical	Acyclical	Acyclical	Acyclical
Housing	Strong Procyclical	Strong Procyclical	Moderate procyclical	Moderate procyclical	Procyclical
Furniture	Acyclical	Acyclical	Weak Procyclical	Acyclical	Acyclical
Appliances	Strong Procyclical	Strong Procyclical	Moderate procyclical	Moderate procyclical	Procyclical
Other household equipment and textiles	Weak Procyclical	Acyclical	Moderate procyclical	Weak Procyclical	Acyclical
Household consumables	Moderate procyclical	Strong Procyclical	Moderate procyclical	Moderate procyclical	Procyclical
Domestic workers	Acyclical	Acyclical	Acyclical	Acyclical	Acyclical
Other household services	Acyclical	Acyclical	Weak Countercyclical	Weak Countercyclical	Acyclical
Health	Weak Procyclical	Acyclical	Acyclical	Moderate Countercyclical	Acyclical
Vehicles	Moderate procyclical	Acyclical	Acyclical	Acyclical	Acyclical
Public transport	Weak Procyclical	Acyclical	Acyclical	Acyclical	Acyclical
Communication	Acyclical	Weak Countercyclical	Acyclical	Acyclical	Acyclical
Recreation and entertainment	Acyclical	Acyclical	Acyclical	Acyclical	Acyclical
Reading matter	Acyclical	Acyclical	Acyclical	Weak Countercyclical	Acyclical
Education	Acyclical	Acyclical	Acyclical	Acyclical	Acyclical
Personal care	Strong Procyclical	Moderate procyclical	Moderate procyclical	Strong Procyclical	Procyclical
Other	Acyclical	Acyclical	Acyclical	Acyclical	Acyclical