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South African households - how to deleverage without saving
October 2015

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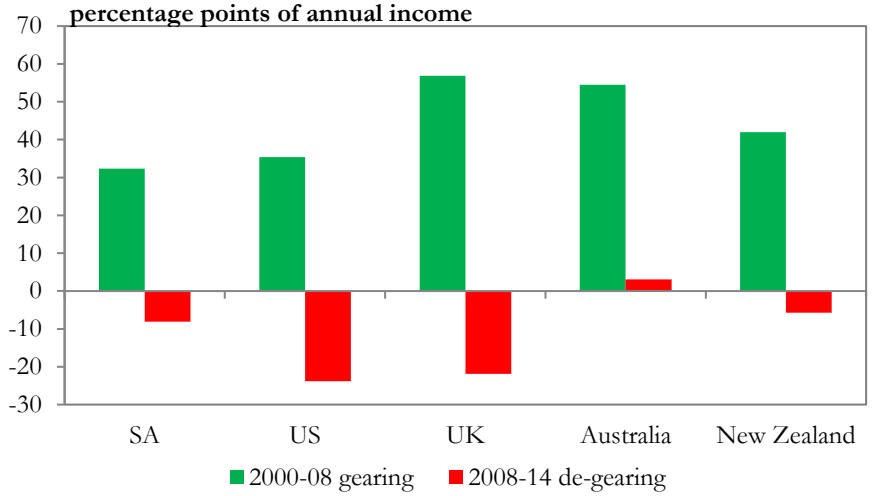
Abstract

This note briefly delves into the saving and deleveraging behaviour of SA households, looking in particular at reasons for the absence of an improvement in the saving rate since the Global Financial Crisis even as households reduced their debt ratio over the period. It further compares the South African case with other high household-debt economies and assesses whether a high debt ratio was a lesser constraint on household consumption in South Africa than in these countries. It finds that, unlike in other countries with elevated debt, deleveraging by South African households did not occur at the expense of their consumption expenditure. Rather, households curtailed their accumulation of residential and financial assets. Looking ahead, this suggests that the room for an acceleration in consumer spending is limited, unless income growth picks up significantly, and that consequently, policy measures should rather aim at restoring a 'saving culture' in the country to support stronger medium-term growth.

Introduction

South Africa's household debt-to-income ratio followed a rather similar pattern to many developed economies in the past fifteen years or so: After a significant increase before the Global Financial Crisis (GFC), from 54,1 per cent in 2000 to a high of 86,4 per cent in 2008, it retreated moderately thereafter (see Figure 1). As of 2Q 2015, the latest data available, it stood at 77,8 per cent. However, and in contrast to other countries that experienced a similar pattern of household leveraging and deleveraging, South African national accounts data have not shown an improvement in the household saving ratio (net saving to net disposable income of households) since the GFC. Indeed, the ratio has remained in negative territory since 4Q 2005. The combination of these two trends thus raises the following two questions: Is there a "paradox" between the lack of improvement in household savings and deleveraging? And in turn, does it mean that elevated debt did not act as a "constraint" on household consumption in recent years, as some observers would believe?

Figure 1: Changes in household debt-to-income ratios in selected countries



To address these two questions, this note first highlights key elements of households' income, expenditure and financial accounts, and points out how – in the South African context – households were able to reduce their debt ratio without an increase in their saving rate. It then attempts to explain why the South African situation differs from that of other countries with elevated household debt, and ascertain whether a high debt ratio was a lesser constraint on household consumption in South Africa than in these other countries. In turn, it looks at domestic economic and policy implications of the SA situation, in particular the extent to which it may inform the need for continued monetary accommodation.[1]

From saving and consumption to debt

Under national accounting of the household sector (see Annexure 1), household disposable income is split between household final consumption and saving. Several reasons may prompt a household to increase or reduce its consumption, such as its level of income, the realization of holding gains or losses on financial or real estate investments, and the way in which the household sees its immediate future. Net saving is the part of current income that is not consumed, and is calculated as a residual between disposable income – net of consumption of fixed capital – and final consumption; when expressing it as a share of net disposable income we obtain the household saving rate (or ratio) measure that is widely flagged in academic literature or media reports.[2]

The household capital account shows how gross saving and net capital transfers to households are available to finance net capital formation and capital consumption. Net acquisition of non-financial assets consists of changes in inventories and, for the most part, gross fixed capital formation, of which (in SA, on average over the past ten years) housing investment is about 60 per cent. The balancing item of the household's capital account is net lending(+)/net borrowing(-). This represents the amount available to acquire financial assets or to be used for repayment of debt; or, in the event of a negative balance, the required accumulation of new liabilities. In practice, the household sector as a whole both acquires financial assets and incurs new liabilities, because some households save while others borrow. The intake of new loans (minus repayment of old loans) will then add to the stock of outstanding household liabilities. Divided by household disposable income, this stock, recorded at any given time (usually the end of the year or of a quarter) provides a common measure of household leverage.

The above sequencing of the different household accounts (income, capital, financial) shows how the accumulation of household debt can be reduced in three different ways, even if disposable income is held constant. Firstly, households can spend a smaller share of disposable income on final consumption expenditure, in which case they will require lesser borrowing to finance the same amount of asset accumulation. Secondly, they can lower fixed capital formation (such as investment in housing) as a share of their income and thirdly, they can reduce financial asset accumulation or even sell financial assets on a net basis.

In addition, the leverage ratio (household liabilities to income) compares a stock to a flow, and as such, can be influenced positively by stronger growth in nominal disposable income, even if the pace of liability accumulation remains fairly constant. This is known as "growing out of debt" or "inflating out of debt", depending on whether the acceleration in nominal income is driven or not by inflation.[3]

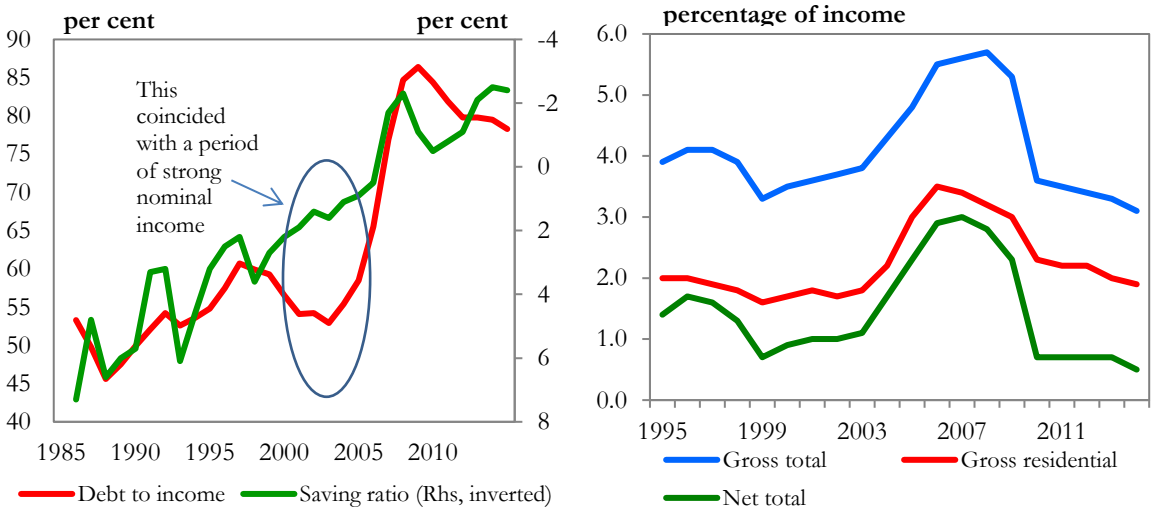
[1] The authors would like to thank Karen Kuhn for her assistance in providing data.
[2] In many countries, however, it is common practice to express the household saving rate in gross terms (i.e. by including consumption of fixed capital in both the numerator and denominator). This has to be borne into account when making international comparisons of saving rates.
[3] Inflating out of debt, however, is only possible if household debt is long-term in nature and mostly carries fixed interest. Otherwise, households will need to refinance themselves at less favourable terms.

What happened in the case of South Africa

The above accounting equivalences also highlight how increases in the credit commitments of households will lead to a decline in their saving, unless counteracted by similar or stronger increases in the assets of households. Generally speaking, therefore, an inverse relationship can be expected between increases in the utilisation of consumer credit and the saving of private households over time.

In South Africa, a clear inverse relationship could be discerned between the ratio of household debt to disposable income and the household saving ratio from the beginning of the 1980s, when the deterioration in the saving ratio of households coincided with the greater use of credit by households (see Figure 2). The abolition of banks' credit ceilings in 1980 probably exacerbated this trend. This inverse relationship, however, did not apply after the GFC. South Africa's household saving ratio came down from 1,9 per cent in 2000 to a dissaving ratio of -2,3 per cent in 2007, temporarily improved in 2008-09 but declined further to -2,4 per cent in 2014, and stood at -2,2 per cent in 2Q 2015. Prior to the GFC, this steady fall in the household saving ratio coincided with a rise in household fixed capital formation, which fueled the boom in the residential building sector over that period (see Figure 3). As a result, the net lending ratio of households showed a stronger deteriorating than their saving ratio – from 1,5 per cent of disposable income in 2000 to -4,5 per cent (effectively, net borrowing) in 2007. As acquisition of financial assets was also fairly strong throughout that period, it was therefore no surprise to see households leveraging strongly prior to the GFC.

Figures 2 and 3: SA household debt and net saving as a percentage of disposable income (left) and household fixed capital formation as a share of income (right)



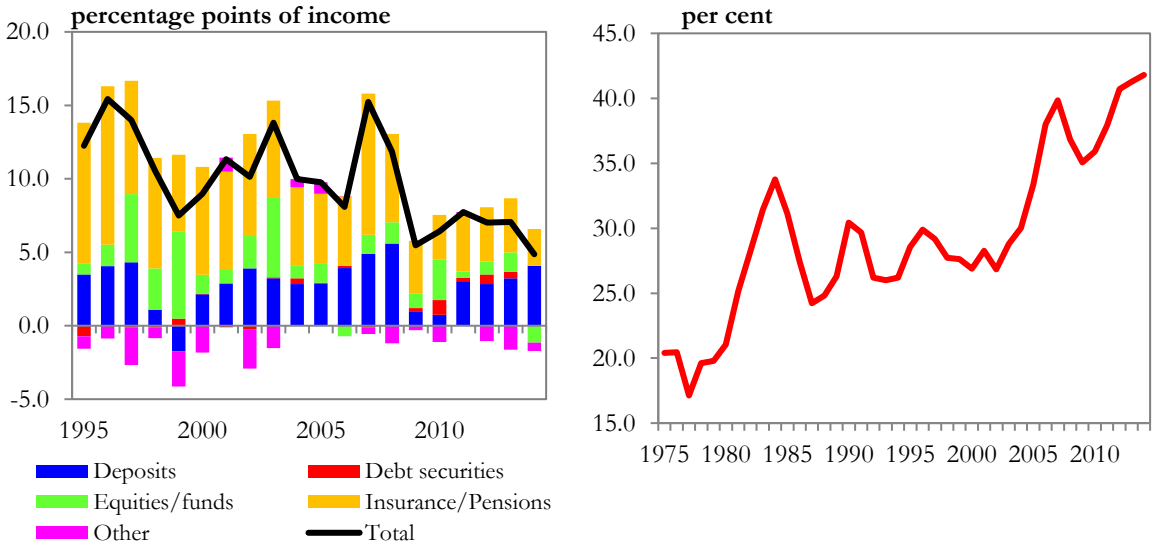
As mentioned in the introduction, households in South Africa slowly reduced their degree of leverage in the years following the GFC. However, they did it by lowering capital formation (both financial and non-financial) rather than by reducing their propensity to consume. Annual growth in final consumption slowed, but in line with real disposable income. By contrast, fixed capital formation, as a share of income, fell back to its lowest level of the past 20 years; and net acquisition of financial assets, which had averaged 11,0 per cent of income in 2000-08, only averaged 6,4 per cent in 2014 (see Figure 4). It was therefore not surprising that the deleveraging of households occurred on the back of slower growth in mortgage advances, whereas at the same time, non-mortgage debt kept rising on balance as a share of disposable income (see Figure 5). This was in part being facilitated by banks, which shifted from mortgages to other credit (mainly consisting of unsecured lending) amid a search for higher margins and to facilitate compliance with Basel III requirements. The introduction of the National Credit Act (NCA) in 2007 and

stricter lending criteria by banks also made it more difficult for households to use mortgage loans to finance current consumption.

Where SA differs from other "high household-debt" countries

As we argued above, the path of South Africa's household debt/income ratio was not that different from that observed in developed economies such as the US, the UK, Australia or New Zealand. This is not a major surprise: While SA is the only emerging-market country out of this list, it shares with the other a large and sophisticated financial industry, with banks that have long played a big role in housing or vehicle finance. Home ownership rates are traditionally high in South Africa (even after accounting for the share of government-sponsored housing), like in the so-called "Anglo-Saxon" countries. Admittedly, SA's household debt ratio is lower than the others in absolute terms, though we think it largely reflects the limited access to formal banking services of the lowest income groups. If we exclude the "unbanked", household leveraging is high in SA, especially by emerging market standards.[4]

Figures 4 and 5: Net acquisition of financial assets by SA households, per category (left) and non-mortgage SA household debt as a share of disposable income (right)



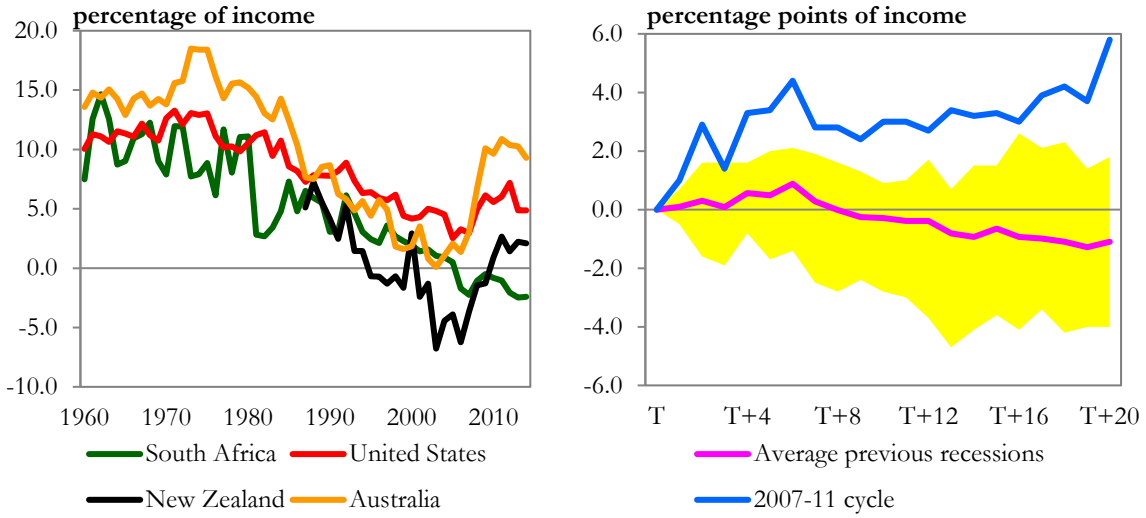
Further similarities occurred in the household saving ratio up to the GFC: From the 1980s up to the second half of the 2000s, all countries in our list saw a long-term declining trend in saving rates. However, this is where the similarities ended: In all cases bar SA, the GFC triggered a marked rebound in saving ratios (see Figure 6). Furthermore, in the US, Australia and New Zealand (although not in the UK), the saving rate remained higher, in the recovery years, than it had been before the GFC, suggesting a lasting structural break from earlier trends. In addition, if we compare the 2008-09 recession and subsequent recovery to earlier cycles, we observe a higher path of the saving ratio compared to historical norms (see, for example, Figure 7 for the US). This does not apply to SA, where the saving rate behaved in line with the pattern of earlier recessions.

Unlike in South Africa, it thus seems that a reduced propensity to consume (out of disposable income) was one of the "tools" households used to reduce their accumulation of liabilities and their debt/income ratio. Fixed capital formation by households also adjusted significantly downwards, as a share of income, in all countries, as it did in SA. By contrast, net acquisition of financial assets only declined temporarily in

[4] According to the 2014 Finscope survey of the Finmark Trust, only about 75 per cent of the adult SA population has access to formal banking services.

the US and Australia – in the latter, it has actually exceeded pre-crisis levels in recent years. The country displaying the strongest similarity with SA has been the UK, where the saving rate only temporarily improved but acquisition of financial assets has shown a marked structural decline. This said, one must also remember that in all the "Anglo-Saxon" countries, nominal disposable income growth was much slower, during and after the GFC, than in SA – limiting their relative ability to grow/inflate out of household debt. All in all, the efforts of South African households at de-leveraging were less pronounced.

Figures 6 and 7: Household saving ratios in selected countries (left) and change in the US household saving ratio during recession and subsequent recoveries (right)



Note: The area shaded in yellow on Figure 7 indicates the range of ratio changes over previous recessions

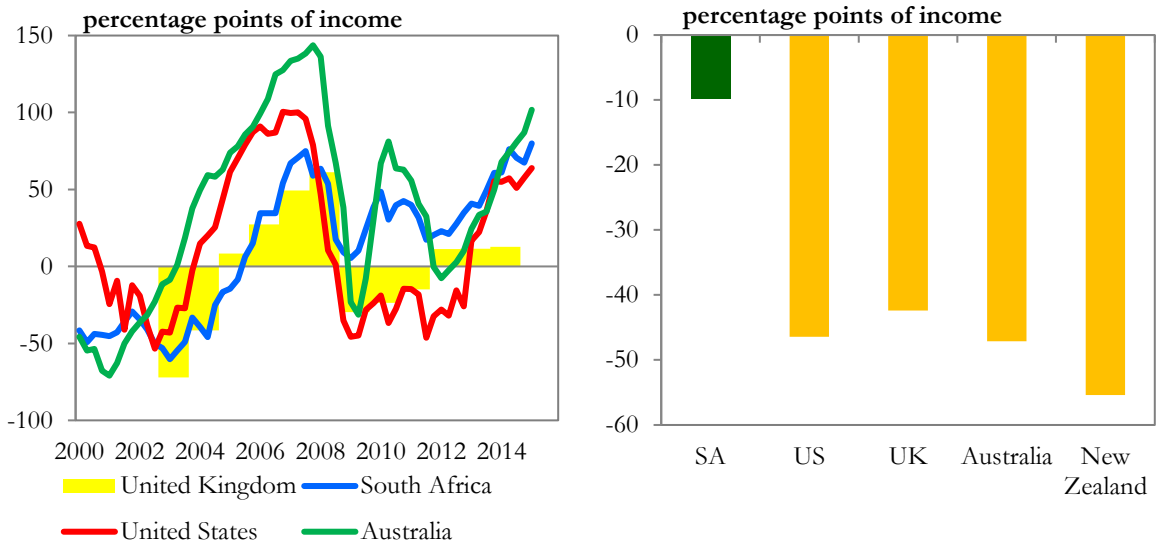
What may explain the South African "exception"

Why has this happened, when South Africa also experienced an unexpected and sharp recession? In theory, according to the life-cycle hypothesis, households save in order to build up a desired level of wealth; in consequence, their saving rate should be a function of expected future income growth, as well as existing wealth levels. Carroll, Slacalek and Sommer (2012), as well as Mody, Ohnsorge and Sandri (2012) argue that the Great Recession, by triggering a lasting increase in economic and job uncertainty and by reducing existing wealth as a share of income, pushed households to save a higher proportion of their income. In South Africa, however, the "destruction" in household wealth (relative to income) was less pronounced than in the other countries under consideration (see Figure 8). This lesser negative "wealth effect" might explain why household consumption was more sheltered in SA.

Still, it would not explain the absence of any significant and/or sustained rise in the saving rate, considering that South Africa's wealth/income ratio declined during the GFC and that trend income growth slowed. Possibly, the distribution of wealth in SA should be taken into consideration. Orthofer (2015) points out that SA wealth is much more concentrated – relative to OECD countries – among the higher-income groups, whose propensity to consume is typically less sensitive to changes in income growth or asset prices than that of lower-income households. This high concentration is particularly relevant for financial wealth – in fact, non-financial wealth, which is probably more evenly spread in SA given the high level of home ownership, declined much less as a share of income than in the other countries (see Figure 9). At the same time, the inequality not just of wealth but also of income distribution may make it harder for low-income households to save even when faced with (on top of an income shock) an uncertainty shock like that created by a strong recession.

The relative "inertia" in the SA saving ratio may also reflect a lesser debt constraint compared to the other countries under consideration. In the case of the US, Glick and Lansing (2011) estimated that regressing the saving ratio on credit availability, as well as net worth, improved the predictability of the model. Separately, Dynan (2012) found that the most highly-leveraged US households were those who cut their consumption most after the GFC, even when their wealth losses were proportionally less than those of other households. Bunn and Rostom (2014) found similar evidence in the UK. Such studies would seem to confirm what anecdotal evidence has long suggested: Highly-indebted households did not save more just because of wealth losses or higher fears of unemployment, but because access to credit became limited – or in some cases was cut off.[5]

Figures 8 and 9: Variations in household wealth/income ratios (from 20-year averages, left) and changes in non-financial wealth/income ratios since 2007 (right) in selected countries



Note: UK data on Figure 8 are only available on an annual basis

We suspect this did not happen to the same extent in South Africa. Admittedly, both anecdotal evidence and surveys indicated a tightening of lending conditions after the GFC and the introduction of the NCA: At equal creditworthiness, borrowers pay more relative to prime than ten years ago. But SA banks experienced lesser financial stress than their US/UK counterparts (as evidenced, among others, by lower credit spreads on bank debt at the time), and the lack of major property price declines in SA reduced the "negative collateral" effect.[6] At the same time, solid wage and employment gains in the public sector (as much as 25 per cent of formal non-farm employment in SA) – where the risk of the borrower losing his or her job is lower – probably encouraged banks to target these employees for new loans. Finally, as we mentioned above, the mix of new regulations and low margins in banks' traditional mortgage business led them, from 2009 to 2013, to boost unsecured loans at the expense of asset-backed credit – effectively, encouraging household consumption at the expense of fixed capital formation.

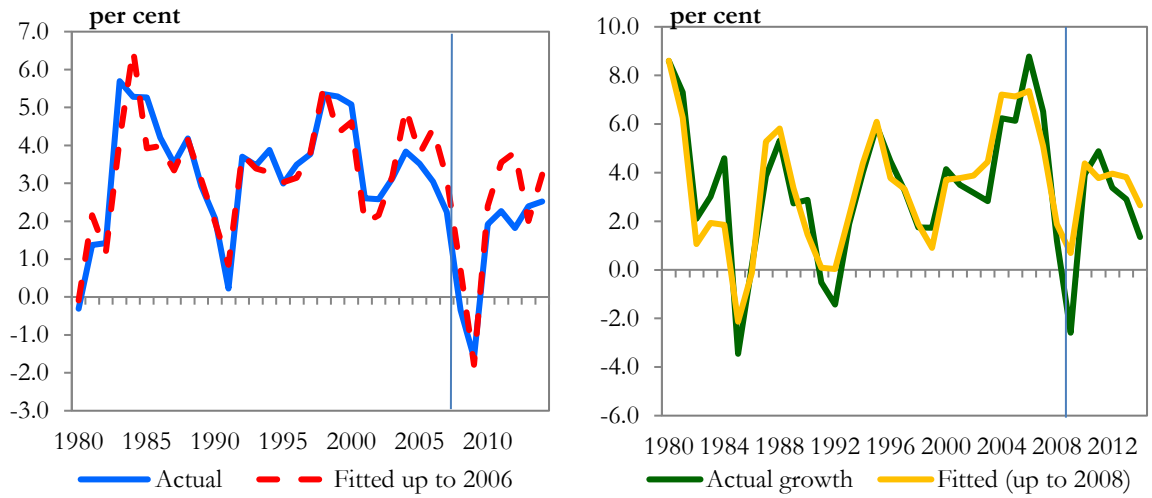
[5] Interestingly, Andersen, Duus and Laerkholm Jensen (2014) also found that in the case of Denmark, highly-indebted households experienced a sharper adjustment in consumption during the crisis, irrespective of income and wealth developments. They, however, attribute it to a sudden rise in these households' financial uncertainty rather than to actual limits on their ability to borrow.

[6] In an environment of falling property prices, banks will be less willing to provide property-backed loans (or at least, impose a lower loan-to-value ratio) for fear of a net capital loss in the event of the borrower defaulting. This constraint on additional borrowing would be most likely to apply on the more highly-indebted households.

Has the consumer's reaction function changed?

To try and ascertain whether the "debt constraint" was in fact lower in SA than in other countries, we run a simple regression of real household consumption in both SA and the US, up to the beginning of the crisis (2007 in the US, which was hit first, and 2008 in SA). In both cases, we combine a long-term equation – regressing the log of real consumption on real disposable income (plus real wealth in the case of the US)[7] – with a shorter-term error correction model incorporating changes in income, wealth and the real interest rate (see Appendix 2).[8] We then use these equations to test whether they accurately predict (or not) the behavior of real consumer demand in the aftermath of the crisis.

Figures 10 and 11: Actual and fitted year-on-year growth in real household consumption in the United States (left) and South Africa (right)



Unsurprisingly, the results are somewhat different between the US and South Africa. In the case of the US, we find that our model over-estimates annual household consumption growth by 0,7-0,8 percentage point, on average, per year in the aftermath of the GFC (see Figure 10). By contrast, in South Africa, our model over-predicts consumption growth by a smaller amount, on balance, after the crisis, with the exception of 2009, when spending fell by less than our equation suggested (see Figure 11). Disposable income, wealth and real interest rates were key drivers of consumer spending before the GFC and remained afterwards. Thus, while there may have been a "debt constraint" on households in SA, it seemed less stringent than in the US or other countries with high household leverage.[9] This, together with the relative stability in property wealth relative to income, the distribution of financial wealth, the expansion of public-sector jobs and the changing lending practices of banks, probably explain why the household saving rate did not rise in SA.

Implications for South Africa's economy and policy

This apparent South African "exception" – the absence of a rebound in the household saving rate – may have important implications for the economic outlook going forward, and the subsequent policy response. First, there is no "pent-up" consumer demand as might be the case in countries where

[7] We did not include a real wealth variable in the long-term SA equation as it did not improve the specification of the equation.
[8] In the US error correction equation, we also include the change in the unemployment rate to account for the "economic uncertainty" factor. However, unemployment series in SA are not available before 1994.
[9] We also ran a simple regression for Australian household consumption from 1990 to 2006, which similarly over-predicts actual spending in the post-GFC years.

households markedly increased their precautionary savings during and after the GFC. Therefore, at least in the near future and barring an unlikely employment recovery that would boost income, one cannot expect much of a pickup in consumer spending even if the debt ratio falls further to levels deemed more sustainable in the longer run. Second, the outlook for a recovery in housing investment is also uncertain. A lower leverage ratio may eventually encourage households to invest again in property; but at the same time, there are limited savings available to finance such investments, and banks may keep imposing lower loan-to-value ratios than in the past. Finally, as long as net financial asset formation remains muted, growth in the financial industry will continue to fall well short of the pace seen prior to the GFC.

At the household level, the low saving rate implies that households will face challenges to maintain their living standards during retirement. At an economy-wide level, the failure of the household sector to contribute to the aggregate savings pool increases the reliance on foreign capital inflows to finance domestic investments. These risks indicate a need for policies and initiatives that enhance the country's saving culture and lengthen the "time preference" of agents, which is still short.

By contrast, reflationary policies could be counter-productive at this stage, unless the country faces a new negative income shock. Households are already spending as much out of their disposable income as appears sustainable medium-term, and there is a risk that in an environment of prolonged low real interest rates, they will continue to privilege consumption at the expense of asset formation (both financial and residential). Rather, the policy mix should aim at boosting confidence levels in and outside South Africa, in order to augment fixed capital investment, which remains the key to higher growth conditions in the country.

Conclusion

We can conclude that there is no "paradox" to be found in having a mix of a lower household debt ratio and a lack of improvement in savings. Households in South Africa have gradually deleveraged after the GFC, but not at the expense of their consumption expenditure. Rather, they have curtailed their accumulation of residential and financial assets, which has resulted in slower growth in both the housing and financial industries compared with the pre-GFC years. But unlike in other high household-debt economies, we find no real evidence of a "debt constraint" on consumption. Possibly, the distribution of wealth across income groups, the fact that property prices were more resilient in SA than in other countries studied, and the lower degree of credit rationing domestically account for this "South African exception". Looking ahead, though, our analysis suggests that the room for a consumer-led recovery in coming years is limited, and that policy should instead focus on improving the country's "saving culture", to both reduce household financial vulnerability and improve medium-term growth prospects.

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Appendix 1. A summarized view of the household sector accounts

In a set of national accounts statistics, receipts are known as resources, expenditure is known as uses and the balancing item is the amount needed to bring uses and resources into balance. The balancing items of the various accounts are particularly interesting aggregates for the purpose of analysis. To fully understand what is confined to any given balancing item is important to examine the sequence of accounts leading up to that item. The latter are summarized in the following, simplified table.

Resources	**Uses**
Income Account	
Compensation of employees	Property income paid (interest, rent)
Operating surplus/Mixed income[10]	Current taxes on income and wealth
Property income received	Social contributions paid
Social benefits received	Other current transfers paid
Other current transfers received	Gross disposable income
Use of Disposable Income Account	
Gross disposable income	Final consumption expenditure
Adjustment for change in pension reserves[11]	Consumption of fixed capital
	Net saving
Capital Account	
Net saving	Gross fixed capital formation
Consumption of fixed capital	Change in inventories
Net capital transfers received	Net lending (+)/Net borrowing (-)
Financial Account	
Net lending	Net increase in cash and bank deposits
Net mortgage borrowing	Net purchases of securities
Net incurrence of other liabilities	Net accumulation of insurance and pension assets
Net increase in other payables	Net increase in loans/other receivables

Note: The items highlighted in green reflect the net incurrence of debt.

[10] Operating surplus is the activity imputed to homeowner-occupiers consisting of providing housing services to themselves as occupiers of the accommodation concerned. Mixed income refers to that income where the remuneration of capital and labour which cannot be distinguished (the case, for instance, of family-owned businesses).

[11] This adjustment is necessary because contributions paid to pension funds, as well as the pensions paid out by these funds, are treated as contributions to, and benefits from, the social security system, even though they should be treated in the same way as transactions with the life insurance companies. However, transactions with pension funds are also recorded in the financial accounts. Therefore, it is necessary to make an adjustment in the non-financial account so that the value of the balancing item (saving) carried forward into the financial account is correct. The adjustment equals the change in pension entitlements, thus the name.

Appendix 2. Estimation equations for US real private consumption

The long-term equation: **LRCONS = C(1)*LRDI + C(2)*LRWEALTH + C(3)**

Where LRCONS is the log of real private consumption, LRDI the log of real disposable income, and LRWEALTH the log of real household wealth

Estimation results:

Dependent Variable: LRCONS
Method: Least Squares
Date: 07/14/15 Time: 10:19
Sample: 1960 2007
Included observations: 48

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRDI	0.873259	0.022062	39.58183	0.0000
LRWEALTH	0.154799	0.019312	8.015603	0.0000
C	-0.641369	0.031112	-20.61484	0.0000

R-squared	0.999554	Mean dependent var	8.415277
Adjusted R-squared	0.999535	S.D. dependent var	0.485459
S.E. of regression	0.010472	Akaike info criterion	-6.219688
Sum squared resid	0.004935	Schwarz criterion	-6.102738
Log likelihood	152.2725	Hannan-Quinn criter.	-6.175493
F-statistic	50476.35	Durbin-Watson stat	0.845779
Prob(F-statistic)	0.000000		

The error correction equation: **DLRCON = C(1)*RES_CONS2(-1) + C(2)*DLRDI + C(3)*DUNEMP + C(4)*DWEALTH + C(5)*RRATE + C(6)**

Where DLRCON is the (annual) change in the log of real private consumption, RES_CONS2 is the residual of the long-term equation, DLRDI the change in the log of real disposable income, DUNEMP the change in the unemployment rate, DWEALTH the change in the household wealth-to-income ratio and RRATE the real Fed funds rate

Estimation results:

Dependent Variable: DLRCON
Method: Least Squares
Date: 07/14/15 Time: 10:27
Sample (adjusted): 1961 2007
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES_CONS2(-1)	-0.445778	0.099534	-4.478667	0.0001
DLRDI	0.706721	0.074388	9.500427	0.0000
DUNEMP	-0.007028	0.001427	-4.924665	0.0000
DWEALTH	0.017987	0.005868	3.065246	0.0038
RRATE	-0.000956	0.000520	-1.839668	0.0731
C	0.012808	0.003179	4.028454	0.0002

R-squared	0.846695	Mean dependent var	0.035545
Adjusted R-squared	0.828000	S.D. dependent var	0.016143
S.E. of regression	0.006695	Akaike info criterion	-7.056179
Sum squared resid	0.001838	Schwarz criterion	-6.819990
Log likelihood	171.8202	Hannan-Quinn criter.	-6.967300
F-statistic	45.28829	Durbin-Watson stat	1.917886
Prob(F-statistic)	0.000000		

Appendix 3. Estimation equations for South African real private consumption

The long-term equation: **LRCONS = C(1)*LRDI + C(2)**

Where LRCONS is the log of real private consumption and LRDI is the log of real disposable income

Estimation results:

Dependent Variable: LRCONS
Method: Least Squares
Date: 07/29/15 Time: 13:54
Sample: 1975 2008
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRDI	1.116571	0.013570	82.28160	0.0000
C	-1.644323	0.186571	-8.813415	0.0000

R-squared	0.995296	Mean dependent var	13.70426
Adjusted R-squared	0.995149	S.D. dependent var	0.295039
S.E. of regression	0.020550	Akaike info criterion	-4.874900
Sum squared resid	0.013514	Schwarz criterion	-4.785114
Log likelihood	84.87330	Hannan-Quinn criter.	-4.844280
F-statistic	6770.262	Durbin-Watson stat	1.734470
Prob(F-statistic)	0.000000		

The error correction equation: **DLRCONS = C(1)*RES_CONS2(-1) + C(2)*DLRDI + C(3)*DLRPROP + C(4)*RRATE(-1) + C(5)*DUM_TRANS + C(6)*DUM_CEILINGS + C(7)**

Where DLRCONS is the (annual) change in the log of real private consumption, RES_CONS2 is the residual of the long-term equation, DLRDI is the change in the log of real disposable income, DLRPROP is the change in the log of real property (non-financial) wealth, RRATE the real prime rate, DUM_TRANS a dummy variable reflecting the mid-1990s political transition (with values of 0,5 in 1994 and 1996 and 1,0 in 1995) and DUM_CEILINGS another dummy variable reflecting bank credit ceilings that were in force until 3Q 1980 (with values of 1,0 from 1977 to 1979, 0,75 for 1980 and zero thereafter).

Estimation results:

Dependent Variable: DLRCONS
Method: Least Squares
Date: 10/23/15 Time: 15:11
Sample (adjusted): 1977 2008
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RES_CONS2(-1)	-0.563838	0.122122	-4.617004	0.0001
DLRDI	0.535202	0.097559	5.485915	0.0000
DLRPROP	0.143309	0.033871	4.230951	0.0003
RRATE(-1)	-0.001280	0.000433	-2.954863	0.0067
DUM_TRANS	0.025519	0.009964	2.561173	0.0168
DUM_CEILINGS	-0.025996	0.007218	-3.601802	0.0014
C	0.021111	0.003916	5.390942	0.0000

R-squared	0.862171	Mean dependent var	0.031604
Adjusted R-squared	0.829092	S.D. dependent var	0.027190
S.E. of regression	0.011241	Akaike info criterion	-5.947900
Sum squared resid	0.003159	Schwarz criterion	-5.627270
Log likelihood	102.1664	Hannan-Quinn criter.	-5.841620
F-statistic	26.06407	Durbin-Watson stat	1.733919
Prob(F-statistic)	0.000000		

Output gap uncertainty – February 2016

Franz Ruch, Byron Botha and Rudi Steinbach

Abstract

Potential output (and therefore the output gap) cannot be directly observed, so estimates thereof are accompanied by uncertainty. This uncertainty consists of three components: "estimation uncertainty" - the actual estimation of the output gap; "updating uncertainty" - the output gap estimate for the current quarter may change in future when updated with new data; and "revision uncertainty" - from occasional revisions of historical GDP figures by Statistics South Africa. Updating and revision uncertainty can change the output gap estimate by as much as 1.3 percentage points within 3 years. Estimation uncertainty is due to estimating both the relationship between variables as well as the unobserved potential growth. This uncertainty can be as large as 1.7 percentage points. The size and type of uncertainty that surrounds real-time measures of the output gap should be more clearly communicated.

Introduction[1]

The output gap, measured as the difference between actual and potential output, serves as a key input in the policy decisions of the South African Reserve Bank. However, since the level of potential output (and therefore the output gap) cannot be directly observed, estimates thereof are accompanied by uncertainty. Recently the Bank released a semi-structural approach to estimating this gap.[2] This approach offers a number of desirable properties including accounting for the financial cycle and improving real-time performance, and has become the current measure of choice used by the Bank in its models. However, communication on the output gap and differing viewpoints on both its magnitude and sign have not sufficiently accounted for the fact that a significant amount of uncertainty surrounds this measure. This uncertainty can be broken down into three components: (i) ***estimation uncertainty*** – the uncertainty that arises from the actual estimation of the output gap; (ii) ***updating uncertainty*** – related to the fact that the output gap estimate for the current quarter may change in future when updated with new datapoints; and (iii) ***revision uncertainty*** – resulting from the occasional revision of historical GDP figures by Statistics South Africa (StatsSA) due to the availability of new sources of information.

The three uncertainties defined above are a useful way to address significant uncertainties around the output gap but is by no means exhaustive. An additional source of uncertainty which we abstract from in this note revolves around the identification of the "true" model defining potential growth. Trying to define this "true" model is like trying to define the meaning of life – it's an impossibility. Two points, however, are worth mentioning. First, there are a multitude of approaches to estimating the output gap from simple filters such as the HP filter to more complex structural models such as Structural VARs and Dynamic Stochastic General Equilibrium (DSGE) models that use economic theory. Each of these approaches have certain appealing properties but none is likely to be superior in all respects. Second, a single model will not be able to address all economic interactions that matter for the output gap right now, including: recent electricity constraints, the structural slowdown in China, structural unemployment, and changing economic relationships.

[1] The authors would like to thank Jessika Kramer for the compilation of the real-time GDP dataset. See Kramer, J., and Farrell, G. 2014. The reliability of South African real-time output gap estimates. ERSA Working Paper No. 428.

[2] See Anvari, V., Ehlers, N. and Steinbach, R. 2014. A semi-structural approach to estimate South Africa's potential output. SARB Working Paper 14/08.

This note aims to quantify the three components of uncertainty.[3] Also pursuant to improving how the Bank communicates the output gap, we propose adding uncertainty bands to measures of the output gap in history to emphasise the unobservable nature of this policy variable.

Model

In order to estimate the output gap we need to determine the level of potential output. Recently the Bank released a semi-structural approach to estimating the output gap.[4] This approach was introduced to address the impact of the financial cycle following the financial crisis and the realisation that this cycle matters sufficiently for how we define the real economy cycle. This is done by filtering the observable data for real GDP, while controlling for certain macroeconomic factors that may inform the estimate of the output gap- specifically credit extension and capacity utilisation. See appendix A for details on how the model is specified.

Measuring the Three Uncertainties

Estimation uncertainty

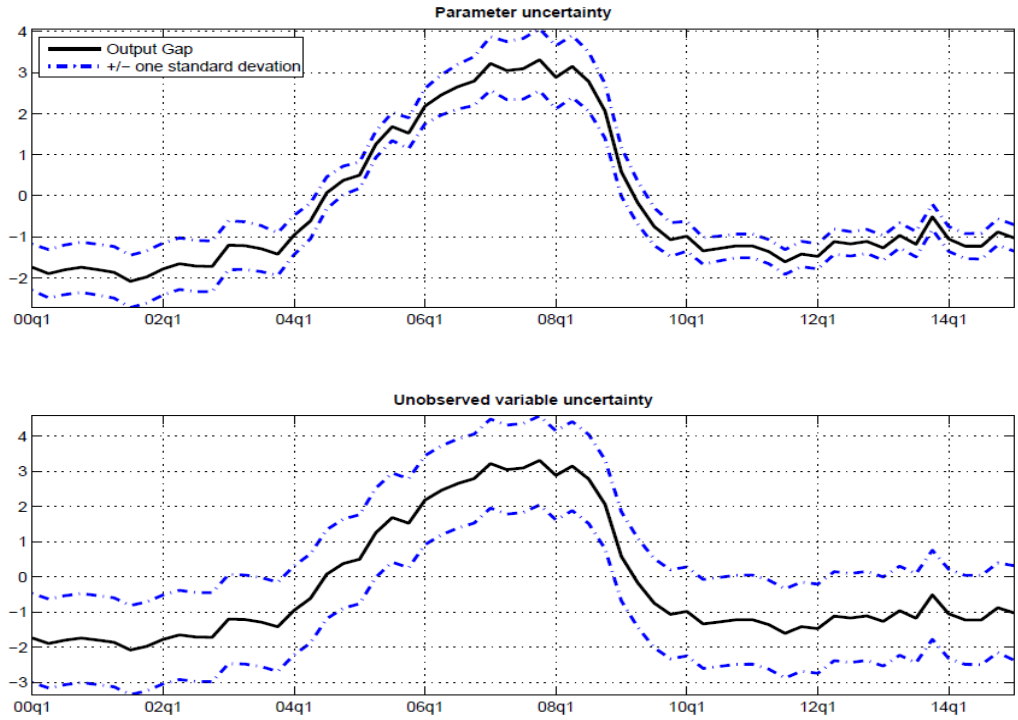
In the context of the semi-structural financial cycle adjusted model, estimation uncertainty arises from the fact that the estimated parameters (See Equations (1) and (2) in Appendix A - parameters in γ and the standard deviations of the error terms, σ_0^2 and σ_1^2) are merely sample-specific estimates of the true parameter values. In most cases this is where estimation uncertainty would end. However, since we also need to determine the value of something that is unobservable – potential output – an extra layer of uncertainty is added to the estimation process.

Figure 1 plots the uncertainty from estimating the parameters (top) and the unobservables (bottom), which make up total estimation uncertainty when combined. It is evident that the uncertainty that emanates from uncovering an unobservable variable is greater than which surrounds the parameter estimates. In fact, since 2000, the standard deviation of estimation uncertainty has been 1.7 per cent. When broken down into its subcomponents, 30 per cent of this is due to the parameters, while the rest reflects uncertainty around the estimation of the unobserved variable. This implies that the output gap estimate would on average have a standard deviation of 0.5 percentage points (i.e. 0.30×1.7) around the mean due to the parameter estimates, and 1.2 percentage points due to the unobservable variable.

[3] South Africa is also not unique in the degree of uncertainty surrounding the output gap. For example, the Norges Bank release forecasts of their output gap with the historical 2014 measure being around -0.5 per cent with 90 per cent confidence bands from -2.5 and 1 per cent. Into the forecast these bands expand to -4 and 2 per cent.

[4] See Anvari, V., Ehlers, N. and Steinbach, R. 2014. A semi-structural approach to estimate South Africa's potential output. SARB Working Paper 14/08.

Figure 1: Estimation Error



Updating and revision uncertainty

Updating uncertainty refers to the revision of the output gap measure that results from the addition of newly released data points at the end of the sample. These additional data provide supplementary information that is then used to more accurately distinguish between the part of GDP that is cyclical and that which is potential. For example, the output gap estimate for 2015Q1 changed when data for 2015Q2 became available. If one thinks of the output gap measure over a specific sample period as the outcome from a set of parameters that need to be re-estimated when new data increases the sample size, then this process is exactly the same as re-estimating a model as your time series becomes longer. The result is that a set of new parameter estimates yields a different historical evolution of potential output, and so too the output gap. In South Africa, there is evidence that updating error is the most important source of error for real-time estimates of the output gap, and that it may cause significant changes to the sign and size of the gap[5].

New data points are of course not the only source of new information. Additional information is also obtained from the periodic updating of methodology and rebasing exercises undertaken by StatsSA, as new methods and new sources of information are absorbed into determining GDP. This process introduces revision uncertainty into the output gap estimate. In other words, to what extent could the current estimate of the output gap change if the underlying data is revised? Importantly however, despite the constant likelihood of revisions at some future date, there seems to be no evidence of any bias in the direction of these revisions[6]. This also suggests that there is no systematic bias in the output gap measure.

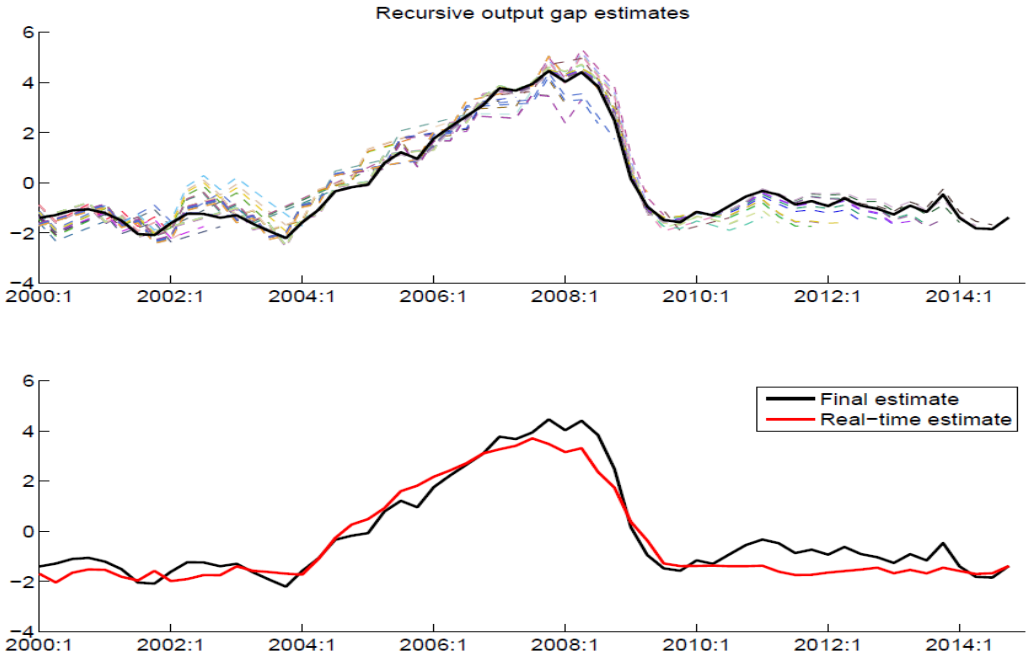
The top panel of Figure 2 shows the result of recursively estimating the output gap (dashed lines) using a vintage dataset which contains real-time GDP releases. The bold black line is the estimate of the output gap using the most recent GDP series data and constitutes the "final estimate", i.e. the estimate

[5] Kramer, J., and Farrell, G. 2014. The reliability of South African real-time output gap estimates. ERSA Working Paper No. 428. provides some evidence to the properties of real-time output gaps in SA.
[6] See van Walbeek, C. (2006). Official revisions to South African national accounts data: magnitudes and implications. South African Journal of Economics, 745-765. for more information.

containing all currently available information. The difference between the estimates at various points in time represent the update error, but also nest the revision error.

Together, update and revision error tell us how reliable real-time estimates of the output gap are – how much we can expect it to change in a quarter, a year, or ten years from now based on historical experience, as was done by Kramer and Farrell, 2014[7] (KF henceforth). First we look at the correlation of the output gap vintages (dashed lines) with the final estimate; the closer the correlation is to 100% the better are real-time estimates of the output gaps. The correlation converges to 100% as the vintage information converges to the full information set, starting at 94% for the earliest vintage (1981Q3) and averaging 98% over the entire sample. This is substantially higher than the 68% found for the best real-time estimate in the KF paper[8].

Figure 2: Real time estimates



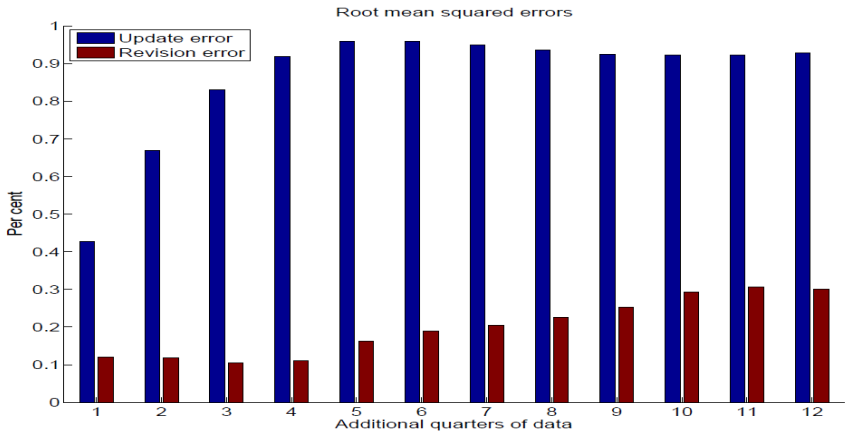
Next we look at the proportion of the time that our real-time estimate has the same sign as the final estimate (the real-time estimate consists of the last estimated point of each vintage estimate, see the bottom panel of figure 2, and is thus what we effectively thought the output gap was through history). This statistic shows that the real-time estimate has the same sign as the final estimate 88% of the time, much higher than the 65% determined in KF using various models. Based on these observations we can start to appreciate that our model performs well on a relative basis, and arguably on an absolute basis as well.

But what are the marginal contributions of updating and revision uncertainty? We answer this by calculating the root mean squared errors (RMSE) from the vintage data estimates, and then repeat the recursive estimation procedure using the full information dataset and re-calculate the RMSEs. The idea being that the "final estimate" of GDP contains all data revisions while the vintage data does not, thus the difference between the errors in the two information sets must be the revision error and the remainder must be the update error. Accordingly, Figure 3 shows that due to updating, the current output gap estimate is likely to change by roughly 0.7 percentage points after two new quarters of data become available, and by roughly 1 percentage point beyond four quarters. In contrast, the revision

[7] Kramer, J., and Farrell, G. 2014. The reliability of South African real-time output gap estimates. ERSA Working Paper No. 428.
[8] The superiority of this approach was highlighted in Anvari, V., Ehlers, N. and Steinbach, R. 2014. A semi-structural approach to estimate South Africa's potential output. SARB Working Paper 14/08.

uncertainty implies a change of about 0.3 percentage points only after 12 quarters. It is important to note that revision error may be smaller than the actual revisions to real GDP growth, since these are distributed into both potential growth and real GDP and thereby mitigates the change in the output gap. The combined change due to update and revision error is therefore 1.3 percentage points beyond 3 years.

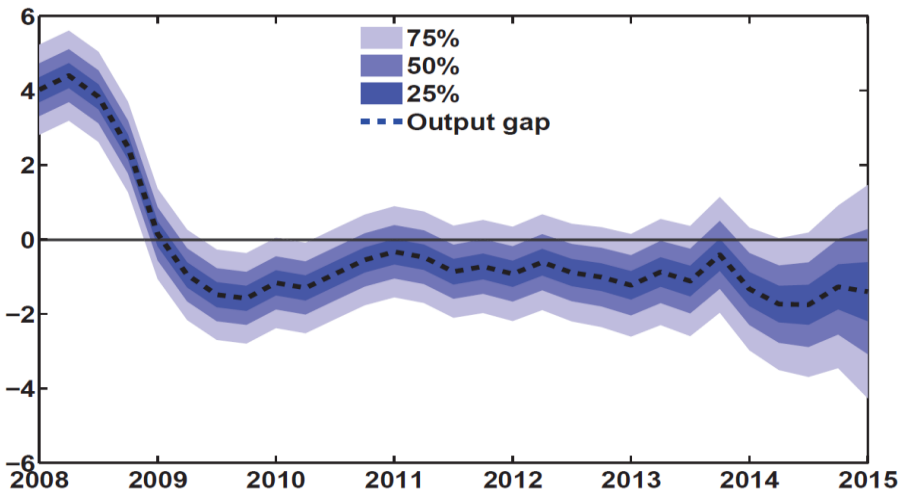
Figure 3: Error decomposition



Communicating the output gap

The challenge when communicating the output gap is that, as discussed in this note, its historical data is accompanied by significant uncertainty – a trait that does not apply to many macroeconomic variables. This note quantifies at least three of the measures of uncertainty that the Bank needs to take cognisance of when communicating potential growth and the output gap. Although uncertainty plays an important role in how policymakers and the public should think about the output gap, the addition of all these errors can get prohibitively large. This puts us between a rock and a hard place. Showing all uncertainty would be nonsensical; showing none would be imprudent. We propose that a combination of update, revision and uncertainty from estimating the unobservable be used to generate a fan chart around historical estimates of the output gap (see figure 4). From figure 3 it is evident that both update and revision uncertainty stabilise after 3 years. Hence, estimates of the output gap three years prior are unlikely to change with new data points and data revisions (see figure B.1 in Appendix B). Exploiting this narrowing into the past we can create a fan that incorporates revision and update uncertainty over the past three years as well as the uncertainty we always have around trying to estimate an unobservable.

Figure 4: Uncertainty around the output gap



Having a conceptual understanding of the uncertainty that surrounds historical estimates of the output gap is vital. First, uncertainty is substantial in real-time and this complicates the decisions of policymakers. For example, figure 4 suggests that, when accurately accounting for uncertainty, the output gap in the first half of 2015 is possibly closed (or even slightly positive) or, alternatively, it could be as large as -4 per cent. Also, depending on how the economy evolves in the future, in three years we may have a distinctly different view of the size and direction of the output gap we currently observe in 2015. Second, given this uncertainty, it is important to discount the importance placed on making decisions based on this indicator. Such decisions should therefore be substantiated with additional sources of information on the health of the economy. Third, current communication clearly indicates the proximate size of uncertainty around the output gap but does not provide evidence of the type and size of uncertainty faced by models of the output gap currently used in the decision making process. Figure 4 can change that.

Conclusion

This note highlights three sources of uncertainty that arise when estimating the output gap: estimation uncertainty, updating uncertainty, and revision uncertainty. It is found that estimation uncertainty yields an average standard deviation of 1.7 per cent around the SARBs output gap estimate. When decomposed, 1.2 percentage points thereof are owed to the uncertainty around estimating something that is unobservable, while the remaining 0.5 percentage points results from uncertainty around the parameter estimates. In addition, the most recent quarter's estimate of the output gap could change by as much as 1.0 per cent 12 quarters down the line due to the updating of GDP with new datapoints over this period. Similarly, that same quarter may change by as much as 0.3 per cent after 12 quarters, as a result of the occasional revision of historical GDP figures by StatsSA.

Appendix A: Model

Let y_t and y_t^T represent the real GDP and the unobservable level of potential output, respectively (in logs). The output gap, $y_t - y_t^T$, is the difference between these two series. The model is set up as follows:

$$\Delta y_t^T = \Delta y_{t-1}^T + \epsilon_{0,t} \quad (1)$$

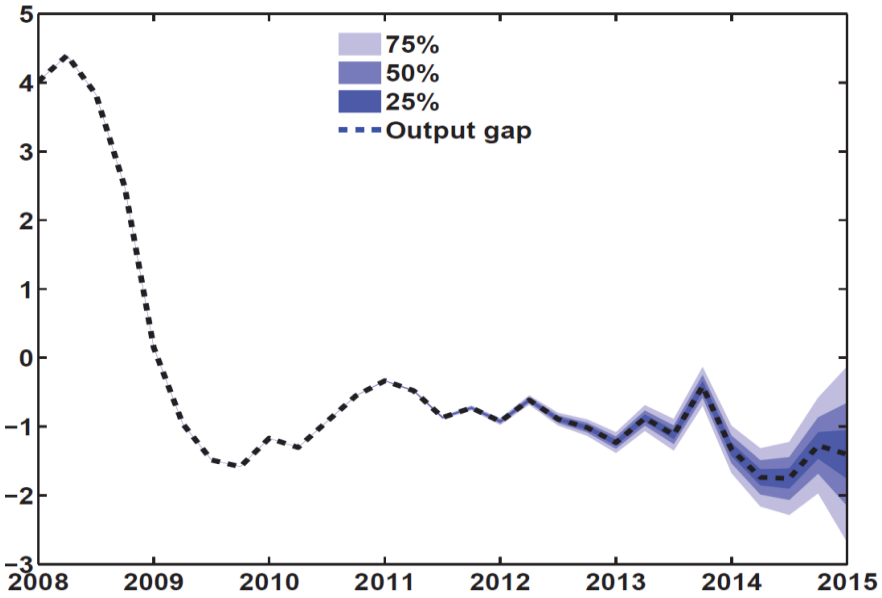
Where Δy_t^T is the quarter-on-quarter change in the (unobservable) level of potential output and $\epsilon_{0,t} \sim N(0, \sigma_0^2)$ is an independent and identically distributed (IID) error term. The output gap is then determined by the following equation:

$$y_t - y_t^T = \gamma X_t + \epsilon_{1,t} \quad (2)$$

where X_t is the vector of macroeconomic factors that informs the output gap estimate. In this specific model, X_t consists of lagged values of the output gap, credit extension and capacity utilisation. As in Equation (1), $\epsilon_{1,t}$ represents an IID error that is normally distributed with a zero mean and standard deviation σ_1^2.

Appendix B: Update and revision uncertainty

Figure B.1 Update and revision uncertainty fades after three years



Current account rebalancing: an exploration of the trade data June 2016

Rowan Walter and David Fowkes

Abstract

We use trade data, expressed as a share of GDP, to explain South Africa's current account deficit and its recent persistence. We find that current account changes are typically a result of movements in net commodity exports and machinery imports. In recent years, machinery imports have been fairly stable as a share of GDP; had they declined as much as they did during the Great Recession, the current account would now be in balance. The deficit did narrow between mid-2014 and mid-2015, due to collapsing oil prices, but from mid-2015 onwards further oil gains have been effectively cancelled out by falling commodity exports. The recent widening of the deficit reflects movements in several smaller categories, including food imports which have increased in response to local drought conditions. Over the longer post-crisis period, imports of consumer durables and semi-durables have also expanded, by a little more than 1% of GDP. Returning these imports to 2010 levels would mitigate but by no means eliminate the current account deficit.

Summary of results[1]

South Africa's large current account deficit (CAD) poses several interesting puzzles. It coincides with weak domestic growth, in contrast to the substantial current account deficit of the pre-crisis boom period. It has also been highly persistent, resisting both significant currency depreciation and slowing GDP growth. While the scale of the deficit is partially explained by large income and current transfers payments, changes in the current account balance are chiefly due to the trade balance. Accordingly, this study draws on trade data from SARS and IHS Global Insight to improve our understanding of the deficit.

Our analysis rests on two pillars. First, we identify the volatile and significant components of the trade balance, defined as the imports and exports capable of explaining changes in the overall current account balance. Second, we rely almost entirely on measurements of these variables *expressed as a share of GDP*. This is helpful because it relates them directly to current account discussions: this balance is typically quantified as a share of GDP. It also allows us to sidestep problematic issues of volumes, currency denominations and deflators.

Our inquiry yields several interesting results:

- The big swings in the current account deficit before, during and immediately after the Global Financial Crisis (GFC) are almost entirely explained by just three groupings: (1) oil and oil-related imports, (2) commodity exports (restricted to the top four categories: gold, coal, iron ore and steel, and platinum group metals) and (3) imports of machinery.
- The bulk of the current account narrowing between mid-2014 and mid-2015 reflected the windfall from collapsing oil prices. From mid-2015 onwards, further oil gains have been effectively cancelled out by falling commodity exports; the overall commodity effect has been neutral.

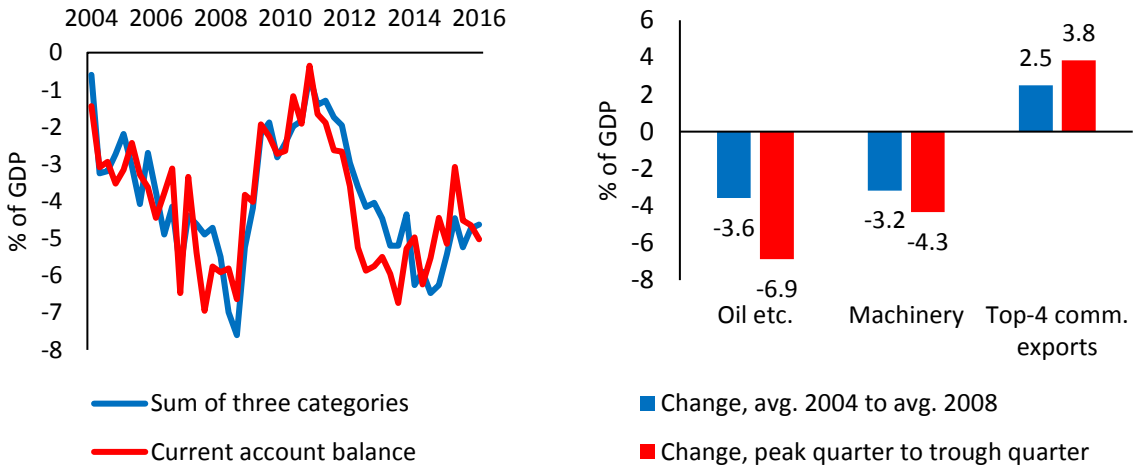
[1] The authors would like to thank Shaun de Jager, Theo Janse van Rensburg, Rudi Steinbach, Erik Visser, Thulisile Radebe and Elmarie Nel for their valuable comments.

- To explain the widening of the deficit in recent quarters, it is necessary to look to a wider range of smaller categories, particularly on the import side. These include food, beverage and tobacco products, likely related to drought. Also implicated are categories such as chemicals and clothes, where volumes have been quite stable but prices have risen.
- Since the crisis rebound, the machinery imports category has been fairly stable as a share of GDP. Had it instead declined as much as it did during the Great Recession, with all other categories remaining unchanged, the deficit would now be closed.
- Imports of consumer durables and semi-durables have expanded since 2010, by a little more than 1% of GDP. This shift is contributing to the present deficit but it is not decisive.
- Disaggregated by country, South Africa's gross exports to China have declined markedly, as a share of GDP, while those to India have picked up. However, the China loss is around twice the size of the India gain. SADC exports (excluding Botswana, Lesotho, Namibia and Swaziland) have improved since the crisis, but have trended lower in recent quarters. Gross exports to the euro area, Japan and the United States have been stable since the crisis. The fact that the US has not claimed a larger share suggests its recovery is not having substantial, direct effects on South Africa.

The rise and fall of the current account deficit, 2004-2010

In the boom years before the GFC, South Africa ran a large CAD. From a position of balance between 2000 and the start of 2004,[2] the current account deteriorated towards a trough of -6.9% of GDP in the third quarter of 2007. At the time, there were several compelling justifications for maintaining such a large deficit. South African macroeconomic policy had benefitted from sweeping reforms, raising the country's creditworthiness. The economy was growing rapidly, drawing in capital goods as well as foreign savings. As a result, imports of machinery climbed by around 3 percentage points of GDP. Furthermore, with higher world oil prices, general oil and petroleum imports also rose as a share of GDP, with the trough to peak change totalling over 6 percentage points (although the series is quite volatile). Of course, South Africa's commodity exports were also growing; exports of the top four export commodities rose by roughly 3 percentage points of GDP from 2004 to 2008. Therefore – as Figure 1 shows – it is possible to explain much of the pre-crisis CAD simply by accounting for these three categories.

Figures 1 & 2: The current account deficit and major trade components



[2] The average quarterly figure for that period is 0.04% of GDP.

As the South African economy fell into recession in 2009, the current account balance closed rapidly. Between the third quarter of 2008 and the second quarter of 2009 it narrowed from -6.6% of GDP to just -1.9% of GDP; by the end of 2010 it was almost balanced, at a mere -0.4% of GDP. What changed? Imports of machinery fell by as much as 4% of GDP. Oil related products moved by 4% of GDP. Exports also fell, but less abruptly; the decline in exports for the top four commodities was around 2% of GDP. Comparing the period of the largest deficits (in 2007 and 2008) and the smallest (in 2009 and 2010) suggests the overall change in the CAD (a move of about 5% of GDP) reflects roughly 50% changes to imports of machinery and 40% commodities, leaving only a small fraction to be explained by other factors.[3]

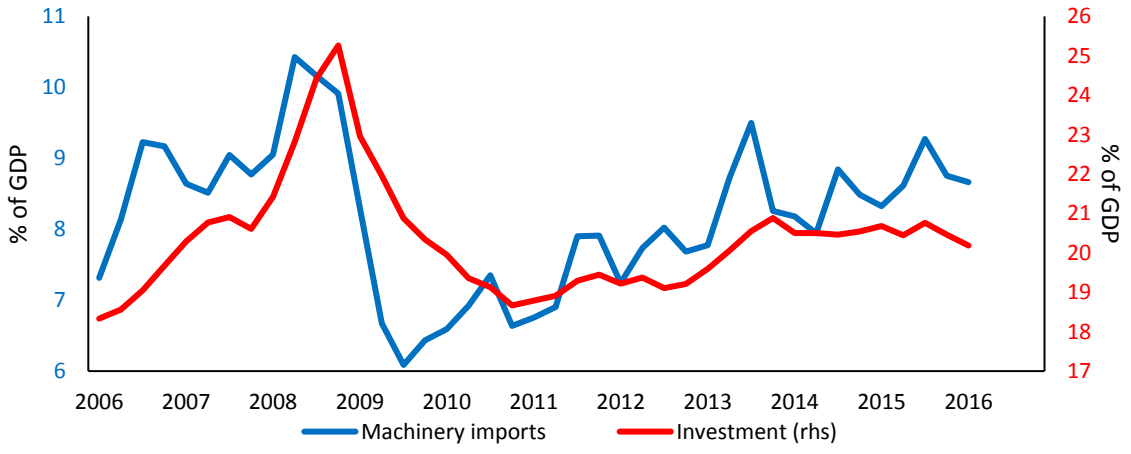
On the current deficit, and how it got so big

In the years after the crisis, the CAD rebounded again, exceeding 5 per cent of GDP in the third quarter of 2012 and surpassing 6 per cent in the middle of 2013. This is mostly explained by two changes.

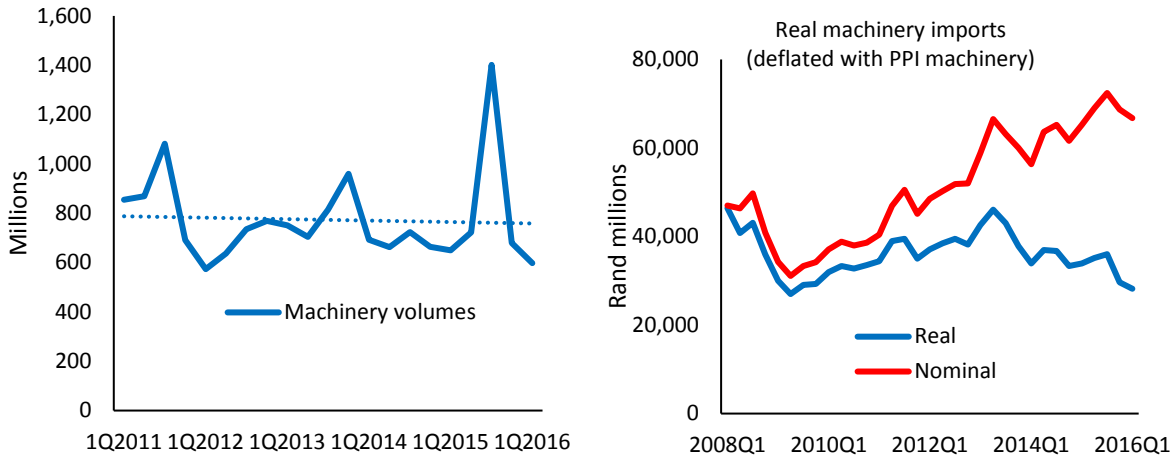
First, oil related imports rose faster than South Africa's commodity exports, reversing the trend that had helped close the deficit following the crisis. From the second quarter of 2009 to the first quarter of 2014, imports in the oil category nearly doubled as the US dollar price of a barrel of oil returned to triple digits. By contrast, South Africa's commodity exports peaked relatively soon after the crisis, exceeding 11% of GDP at the end of 2011, and then began trending steadily lower. The mismatch between weaker commodity exports and rising oil related imports is reflected in South Africa's terms of trade, which deteriorated from 2011 to 2014. It was only in mid-2014 that oil prices finally began behaving like other commodity prices and fell, supporting the current account.

Second, machinery imports also picked up strongly, from barely over 6% of GDP in the depths of the crisis to 9.5% of GDP in the third quarter of 2013. This shift is somewhat harder to explain. During the pre-crisis boom investment rose steadily, from about 18% of GDP in 2005 to more than 23% in 2008; in the post-crisis period it has been fairly stable at around 20% of GDP. Why did machinery imports rise despite stagnant investment? One explanation is that demand for machinery imports is price inelastic, so their rise simply reflects exchange rate depreciation. There is evidence for this in the machinery component of the PPI, which has risen just over 40% from its trough in 2011; the unit value index for metal products, machinery and equipment is up 55% over the same time frame. Import volumes, meanwhile, have been volatile but flat; the trend is narrowly down.

Figures 3, 4 & 5: Total investment, machinery imports and price effects

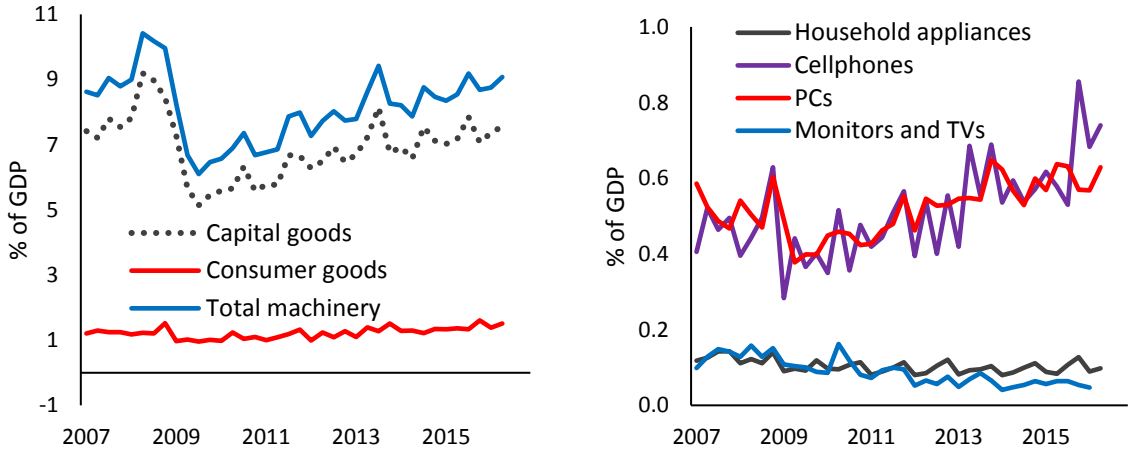


[3] Plausible candidates are imports of transport equipment and vehicles, both of which adjusted abruptly to the recession.



Another possibility is that the composition of machinery imports switched from investment goods (such as mining equipment) to consumer goods (like smart phones). There is some limited evidence for this: imports of consumer machinery[4] have risen from just over 1% of GDP in 2010 to 1.4% in 2015. But they are still a relatively small share of the total, at not more than 19% of machinery imports in any post-crisis quarter. We return to the problem of consumer imports later.

Figures 6 & 7: Disaggregated machinery imports



Rebalancing, interrupted

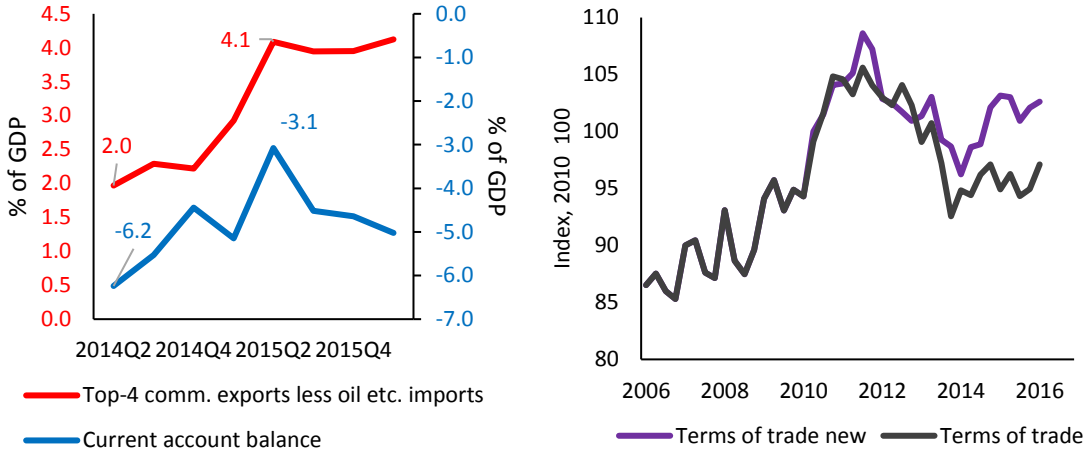
From the second quarter of 2014 to the second quarter of 2015, South Africa's CAD halved, from 6.2% of GDP to 3.1%. This was a welcome development, mitigating the country's vulnerability to a global financial environment that had become less favourable for emerging markets, particularly those with large CADs. It also suggested the economy was flexible, able to respond to exchange rate incentives and rebalance. However, in contrast to the adjustment that occurred in 2009 and 2010, machinery imports actually increased slightly over the period. There was also significantly greater reliance on commodity price

[4] Defined as household appliances, cell phones, monitors and TVs and personal computers. At least some of these items, especially personal computers, should be classified as business investment, but it is not possible to separate the two given the available data.

movements, which explain about two thirds of the observed rebalancing.[5] Imports of oil and related products collapsed with the fall of world oil prices, from around 6% of GDP in early 2014 to under 4% in 2015 (and 2.5% of GDP in the first quarter of 2016, a level last seen in 2005). Meanwhile, commodity exports were more stable, staying close to 8% of GDP throughout the rebalancing period. The result was an oil windfall. It was not, as might have been hoped, a process of import-substitution and export-expansion driven by exchange rate depreciation.

This also helps explain why rebalancing was not sustained. From the second half of 2015, as commodity prices fell across a broad front, SA's commodity exports re-synchronised with oil imports. To put it another way, the gains from cheap oil were once again balanced out by losses from export commodities (see Figure 3).

Figures 8 & 9: Commodities and the current account deficit

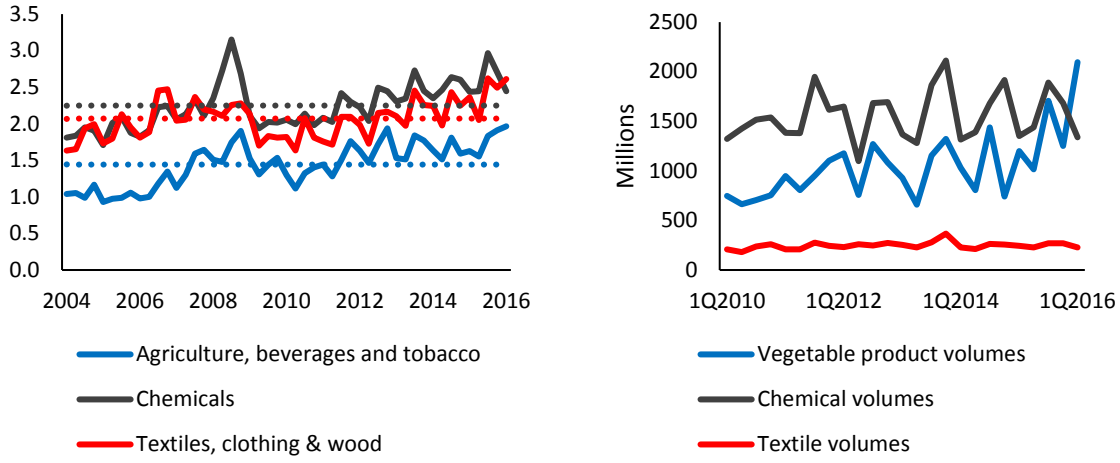


The fact that commodity balances turned neutral after mid-2015 helps explain why the CAD ceased narrowing. But it does not explain why it deteriorated again, expanding by around 2 percentage points of GDP from the second quarter of 2015 to the first quarter of 2016. Once again, imports of machinery played no active role, continuing broadly unchanged.[6] Much the same applies to vehicles and transport equipment, two categories which adjusted sharply during the Great Recession but have been stable over the recent period.

Part of the CAD re-widening comes down to growing imports in three categories: clothing and textiles, chemicals, and agricultural products, beverages and tobacco. All of these have shifted above their longer term averages since 2013; had they maintained their share of GDP recorded in the second quarter of 2015, the current account deficit would have been around 1 percentage point smaller in the fourth quarter of 2015 and the first quarter of 2016. Import volumes (from the DTI) have been relatively unchanged for textiles and clothing, as well as chemicals, suggesting exchange rate depreciation is to blame. Volumes of vegetable products have increased markedly, however, presumably in response to domestic food shortages caused by drought. Apart from these three categories, no other major culprits are obvious in the data. The period under examination is also quite short, so data volatility makes it harder to identify the patterns.

[5] It is possible to explain the other third by invoking just one more factor: exports of motor vehicles picked up substantially from mid-2014, adding almost a full percentage point of GDP to the current account balance.
[6] The values for machinery imports over the recent deterioration period are 8.6% of GDP for 2015Q2, 9.3% for 2015Q3, 8.8% for 2015Q4 and 8.7% for 2016Q1. The corresponding numbers for the CAD are -3.1, -4.3, -5,1 and -4.3.

Figures 10 & 11: Shares and volumes of three significant contributors to CAD widening

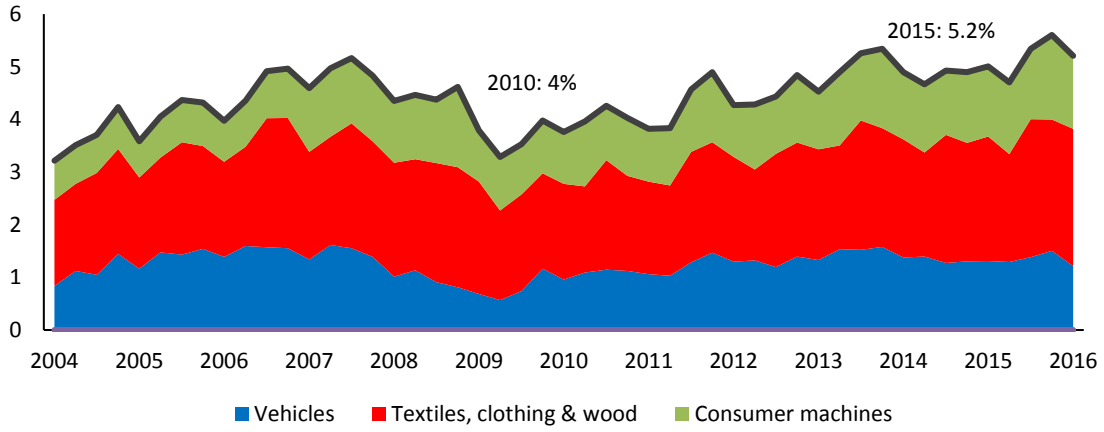


Should we blame consumption?

One compelling theory of the current account deficit holds that it represents demand leakage from stimulatory macroeconomic policy. Given that South Africa's potential growth was overestimated through much of the post-crisis period, it is possible that policy attempts to return the economy to growth rates over 3% might instead have created excessive demand. In particular, the combination of low interest rates and a fiscal stimulus which was largely captured by public sector employees might well have produced a boom in consumption of durables and semi-durables (such as cars, phones and clothing). This theory has the attractive implication that the current account deficit could be narrowed quite cheaply. Reduced consumption would not have the same effects on longer-run potential growth as reduced investment. Furthermore, the short term growth consequences would be minimised for South Africa as lower imports would raise net exports, even if some vendors would lose their profit margins on re-selling imported goods.

The data provide some support for this hypothesis. Imports of consumer-related durables and semi-durables have risen from about 4% of GDP in 2010 to 5.2% of GDP in 2015 (although some of these are likely intended for re-export or should be classified as investment). Reversing this change would therefore remove as much as a quarter of the prevailing CAD. This is a meaningful change, but insufficient to rebalance the current account. Capital goods and commodities remain the key swing variables.

Figure 12: Imports of consumer durables and semi-durables

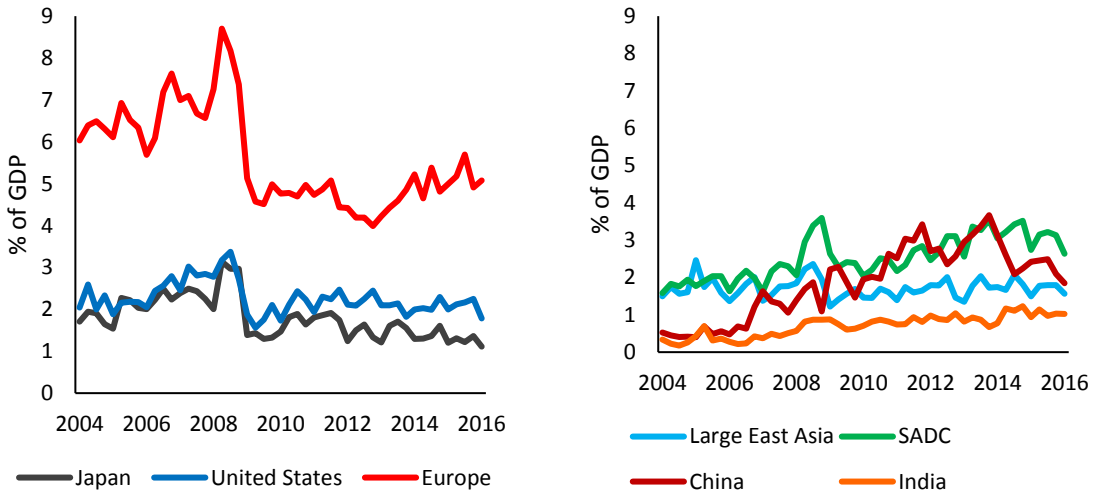


On export partners

The same data used above may also be used to explore changes in exports to our major partners. As is widely known, China is South Africa's single largest export partner; Chinese demand has also fallen as it rebalances away from investment-led growth to consumption. This is plainly visible in the data: exports to China peak at 3.7% of GDP at the end of 2013 (although not, interestingly, at the terms of trade high point of 2011), and have since then declined to under 2% of GDP. India has been mooted as a possible replacement for China, and exports to India have indeed risen. The change, however, is only about 0,5% of GDP since the GFC, a fraction of the lost exports to China. SADC exports (excluding the BLNS countries) have also improved since the crisis, by around 1 percentage point of GDP, although they have weakened in the most recent quarters.

Of the advanced economies, exports to the USA, Europe and Japan have not returned to pre-crisis peaks, measured as a share of GDP. The scale of the decline in the European case is especially striking: exports averaged 7.8% of GDP in 2008; for 2015 they were down to 5.2%. Of course, European economic performance has been extremely weak, with two recessions in the euro area in just six years, so one might expect subdued import demand. The United States, however, has had a more robust recovery, which should have generated spill overs to other countries, including South Africa. Yet exports to the US have been stable close to 2% of GDP since the crisis, suggesting its recovery is not making it a relatively more attractive export market for South Africa.

Figures 13 & 14: Exports to various major markets[7]



[7] 'Large East Asia' comprises Australia, Hong Kong, Malaysia, Philippines, Singapore, South Korea and Taiwan. Japan and China are shown separately. 'SADC' excludes the BLNS countries. Including them, plus the sub-Saharan African countries not in SADC, would make SSA South Africa's largest regional export destination.

Conclusion: implications

The obvious takeaway from this study is that current account changes are typically a result of movements in net commodity exports and machinery imports, all expressed as shares of GDP. Commodity outcomes seem largely beyond domestic control. At present, world markets are oversupplied and prices are low, which will serve to shutter marginal producers and re-equilibrate supply and demand. This process is painful but necessary. The consolation for South Africa is that commodity imports are also cheaper. The collapse in the oil price was an important factor in the current account narrowing of 2014 and 2015; unfortunately, if South Africa's terms of trade behave as forecast, there will be no additional support from commodity prices over the next few years.

Machinery imports have not collapsed as they did during the crisis. If they did the CAD would close. This is not necessarily desirable: a CAD is preferable to a recession. But growth is already very low and machinery imports remain persistent: we may get a large current account deficit *and* a recession. One problem is that the exchange rate is less likely to recover while the CAD remains large, but currency weakness itself drives up the share of GDP spent on inelastic machinery imports, sustaining the deficit and exacerbating rand weakness.

A second concern is that the investment expenditures driving capital imports have not – so far – generated growth, perhaps because of inefficiency or lags between incurring the investment costs and achieving results. (The Medupi and Kusile power plants are examples of both phenomena.) The no growth/large CAD/sustained investment puzzle might be resolved by rising growth as investment finally comes on stream. A better growth story would in turn help the exchange rate and render the current account deficit more defensible.

The import story is not all about investment; it has a consumption element. In recent quarters food imports have increased, which is an appropriate response to domestic drought. Over the longer post-crisis period, imports of consumer durables and semi-durables have also expanded, by a little more than 1% of GDP. Returning these imports to 2010 levels would mitigate but by no means eliminate the current account deficit.

There are several opportunities for further research. One is to identify variables that may behave differently in future. We have established that changes in the current account balance typically follow net commodity exports less machinery imports, but gross exports and imports are much larger than these categories and a different kind of CAD adjustment could be possible. Another is to consider how various import categories respond to variables such as long and short term interest rates and the exchange rate. This may establish more clearly the efficacy of policy tools and help explain the missing J-curve. A third task is to disentangle price and volume effects more cleanly.

Credit where it's due: Identifying the drivers of weak credit growth in South Africa – September 2016

Theo Janse van Rensburg, Erik Visser and Danie Meyer

Abstract

Growth in real credit extension to the South African private sector has been very weak in the aftermath of the global financial crisis. According to our model, the slowdown in real credit growth was mainly due to weaker business confidence, with slower private sector output growth and tighter commercial bank lending criteria also playing significant roles. The real repo rate, which has been below its historical averages in the post-2010 period, made a positive but only marginal contribution to real credit growth. If these drivers of credit extension had been at their "normal" levels (i.e. 15 year averages), real credit growth would have been on average almost 2 percentage points higher over the 2010-2015 period.

Introduction[1]

With the exception of two months[2], year-on-year growth in nominal credit extension to the private sector[3] has consistently been in single-digit territory since 2010 – substantially below the 15 per cent p.a. average growth measured over the 1994–2009 period. The decline in the nominal growth rate is only partly attributable to lower (GDP) inflation, which declined from an average 8 per cent p.a. over 1994–2009 to 5,7 per cent p.a. over the 2010–2015 period. Clearly, growth in real credit extension was very weak in the post-global financial crisis (GFC) period.

In this note, we use a simple econometric model to test different explanations for weak real credit growth in the post-GFC period. Our results suggest the slowdown in real credit growth is primarily due to weaker business confidence, with slower real growth in the private sector GDP[4] and tighter commercial bank lending criteria[5] also playing significant roles. We find that the real repo rate made a small positive contribution to credit growth, having been below its historical averages in the post-2010 period. Relative to the other factors, however, its impact is marginal. Furthermore, using monetary policy to offset these other factors would have required extremely large adjustments to the (real) repo rate, to the order of several hundred basis points.

Private sector credit extension drivers

In our analysis we focus on real credit extension (Figure 1) – which we construct by deflating nominal credit extension with the GDP deflator over the 2002 to 2015 period.

1 The authors are indebted to several people for their contributions to this note. David Fowkes was very helpful with editing suggestions, Elmarie Nel assisted with some of the modelling and Shaun de Jager provided forecasts for the household consumption deflator. We are also grateful to George Kershoff from the Bureau for Economic Research for data on the banks' credit standards.

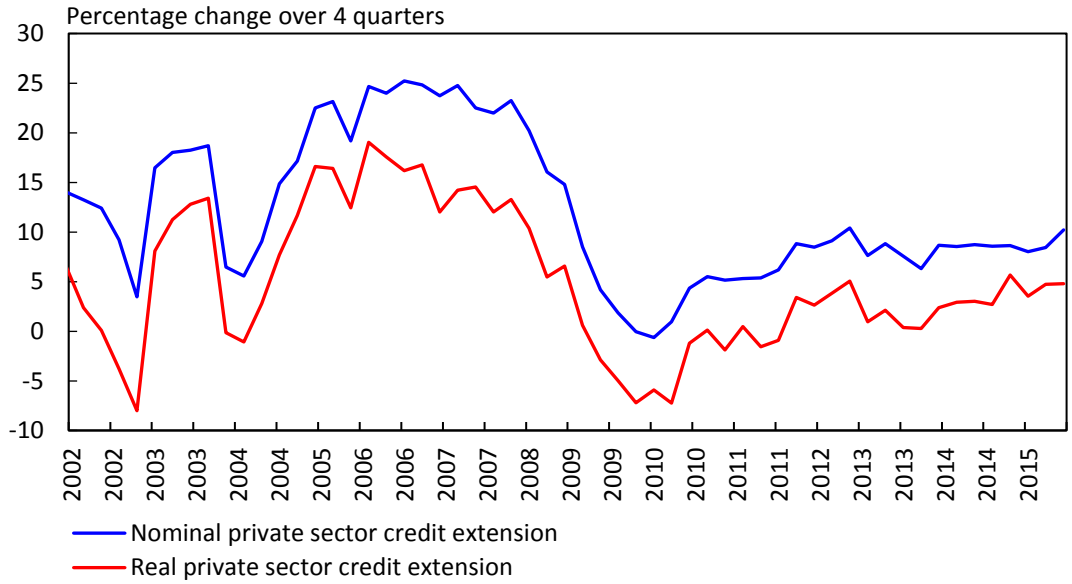
2 December 2012 (10,4 per cent) and December 2015 (10,2 per cent).

3 The credit extension in this note refers to the total credit extended by all monetary institutions to the private sector and includes investments and bills discounted.

4 Private sector GDP growth is defined as GDP at market prices excluding government consumption and investment spending.

5 We proxy commercial bank lending criteria using the mark-up (premium) of the home loan rate to the repo rate.

Figure 1: Nominal and real private sector credit extension



We identify five potential drivers of credit extension:

a) Credit standards

With regard to credit standards, our first point of call was the Bureau for Economic Research's (BER) quarterly survey on banks' credit standards. In this survey, banks are asked to respond to the following question: "How do you think have banks' credit standards for approving applications for loans and credit lines changed?" These credit standards refer to the terms of loans and credit lines, such as maximum size, spread of loan rates over a bank's cost of funds, premiums charged on riskier loans and collateral requirements. The response options are 'tightened', 'not changed' or 'eased'. The results are expressed in terms of a net balance calculated as the percentage of banks that answered 'tightened' minus the percentage of banks that answered 'eased'. The percentage of banks which indicated no change is ignored. A net balance above zero suggests a tightening and below zero an easing of credit standards. The long-term average between first quarter of 2001 and the fourth quarter of 2015 was 31,7 index points.

The relationship between credit extension and the BER credit standards is depicted in Figure 2. Although a strong correlation is evident, the variable is not useful in a modelling sense as changes in credit standards seem to lag growth in credit extension and not *vice versa*.[6] This may be reflective of the commercial banking sector pro-cyclically adjusting lending standards with about a six-month lag, but further work on this is advised.

b) Mortgage rate premium

We then considered the mortgage rate mark-up (or premium) on the repo rate as a proxy for bank lending standards.[7] As depicted in Figure 3, changes in the mortgage rate premium tend to lead changes in credit extension growth.

6 A Granger causality test confirmed this – we rejected the null hypothesis that credit extension does not Granger cause changes in lending standards. The hypothesis was rejected with 10 per cent probability with a two-quarter lag.

7 Internal unpublished data from the South African Reserve Bank.

Figure 2: Real private sector credit extension and BER credit standards

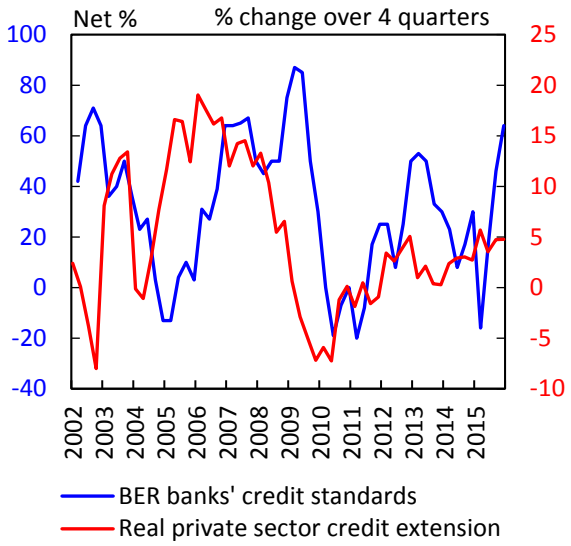
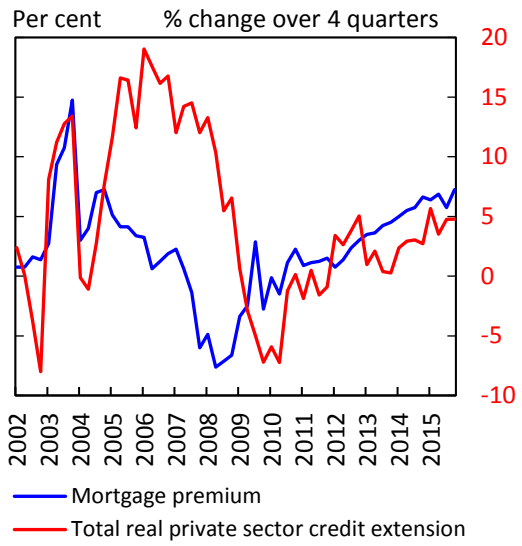


Figure 3: Interest rate and credit extension



Note the upward trend in the mortgage rate premium in the post-2010 period. It would seem that various factors are at play here. Mortgage rates in the pre-GFC period were perhaps priced too low when the residential property market was buoyant, and subsequently reversed in the post-GFC period. In addition, but to a lesser extent than the aforementioned reason, new Basel regulations[8] added to commercial banks' funding costs, which they probably partly passed on to clients via higher interest rates.

c) BER confidence measures

The willingness of consumers to obtain credit is likely to depend on how confident they feel about the future. The overall pressure on affordability as discussed earlier, and generally weak growth (next paragraph) probably had a significant impact on confidence. Figures 4 and 5 depict the BER consumer and business confidence indices against real credit extension growth. Although both confidence measures appear to be strongly correlated with real credit extension growth in the pre-GFC period, business confidence shows a stronger correlation in the post-2010 period (and only the latter was statistically significant when the equation was estimated).

[8] During the course of the past years banks continued to gradually build up holdings of quality liquid assets. This was to ensure compliance with the phasing in of the Liquidity Coverage Ratio (LCR), which became effective on 1 January 2015. The LCR requires banks to hold an adequate stock of high-quality liquid assets to provide for a 30-calendar-day liquidity stress scenario. Banks were required to meet a LCR requirement of 60 per cent from January 2015, 70 per cent in January 2016 and progressively rising to 100 per cent from 2019.

Figure 4: Consumer confidence and credit extention

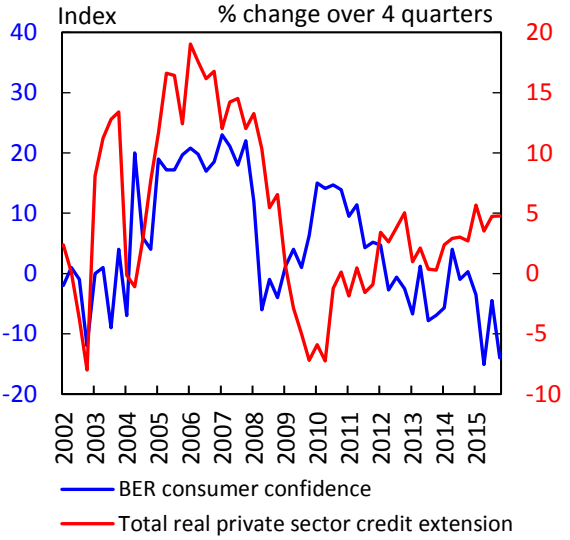
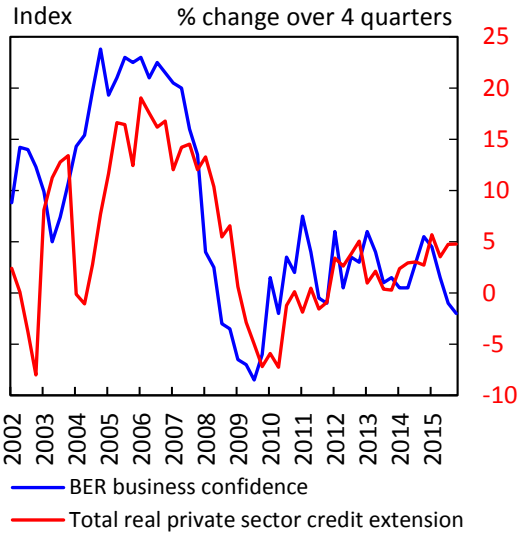


Figure 5: Business confidence and credit extention



d) Private sector GDP

The strong positive correlation between private sector GDP and credit extension is depicted in Figure 6. It is clear from the graph that slower private sector GDP growth in the post-GFC period must have contributed substantially to the lower real credit extension growth during this period.

Figure 6: Private sector GDP and credit extention

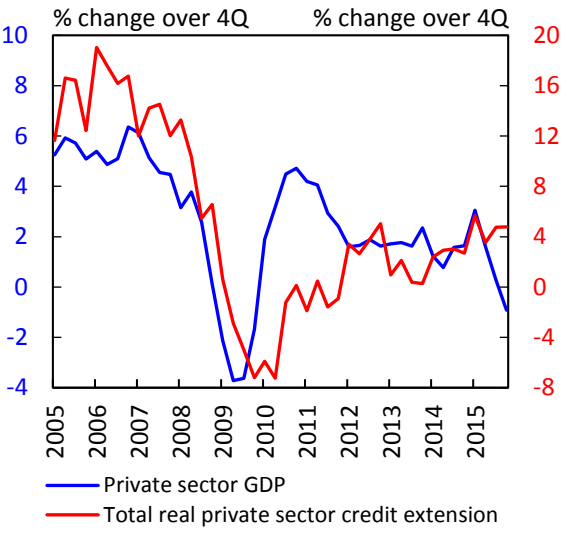
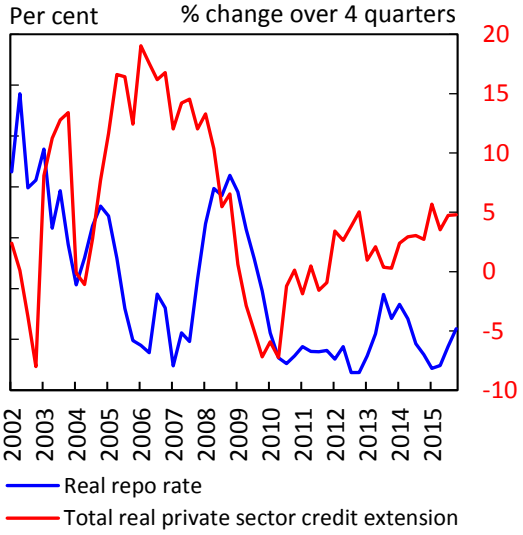


Figure 7: Real repo rate and credit extension



e) Real repo rate

Changes in the real repo rate[9] also seem to have affected real credit growth (Figure 7). Note that the real repo rate has declined substantially throughout the period when compared to the heights reached in 2002 (and to some extent in 2008). On average, the real repo rate in the post-2010 period was substantially below average rates observed in the pre-GFC period.

[9] Ex ante real repo rate (based on household consumption deflator six quarters ahead).

Credit growth under 'normal' circumstances

Based on the drivers identified above, an econometric model was estimated where real credit extension is determined by private sector real GDP growth, BER business confidence, the real repo rate and the mortgage rate premium. Figure 8 depicts the model prediction versus the actual outcomes, whilst more details on the econometric results is presented in Annexure A.

We then conduct an experiment to see what real credit extension growth would have been under "normal" circumstances. We define **"normal" circumstances** as those where the explanatory variables were constant at their respective averages over the 2001–2015 period; namely:

- BER business confidence at 54,1 index points
- Mortgage premium at 257 basis points
- Private sector real GDP growing at 3,0 per cent p.a. (seasonally adjusted and annualised)
- Real repo rate at 1,87 per cent

Figure 8: Model prediction versus actual credit extension

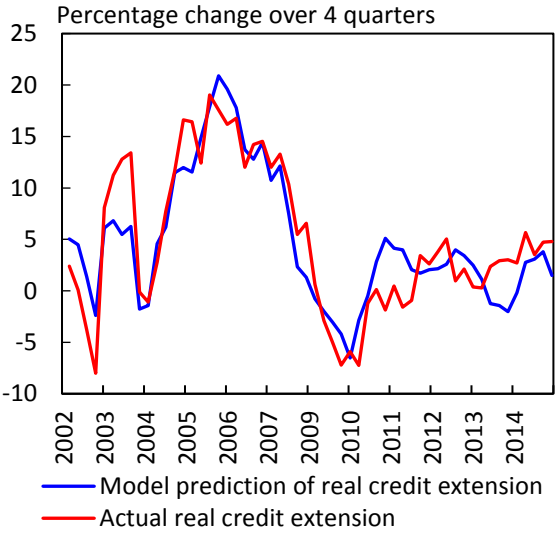
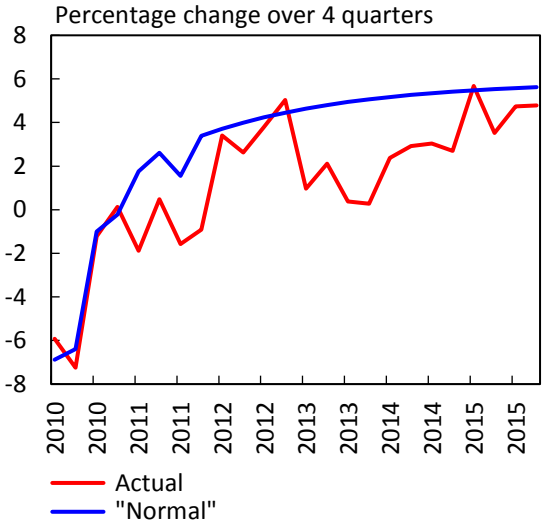


Figure 9: Actual versus model predictions under "normal" circumstances



As Figure 9 shows, where actual real credit extension growth averaged only 1,3 per cent p.a. over the 2010–2015 period, under the "normal" scenario it would have averaged 3,1 per cent p.a.

The contribution by each of the explanatory variables to the deviation from the actual outcome is depicted in Figure 10. To summarise, by the fourth quarter of 2015, the cumulative deviation between the actual and "normal" scenario reached 13,9 per cent, made up as follows (Figure 11):

- BER business confidence: 5,5 per cent (or **40,0 per cent** of the total deviation from actual)
- Private sector GDP: 4,8 per cent (or **34,4 per cent** of the total deviation from actual)
- Mortgage premium on repo: 4,4 per cent (or **31,9 per cent** of the total deviation from actual)
- Real repo rate: -0,9 per cent (or **-6,3 per cent** of the total deviation from actual)

Figure 10: Contributions of explanatory variables to deviation from actual outcome

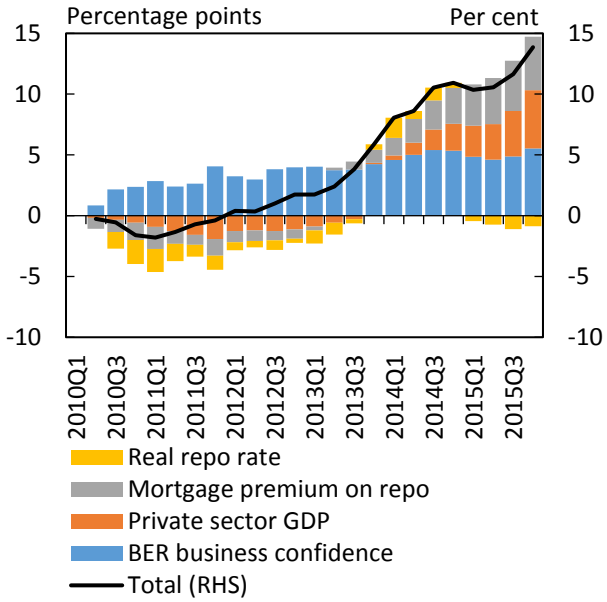
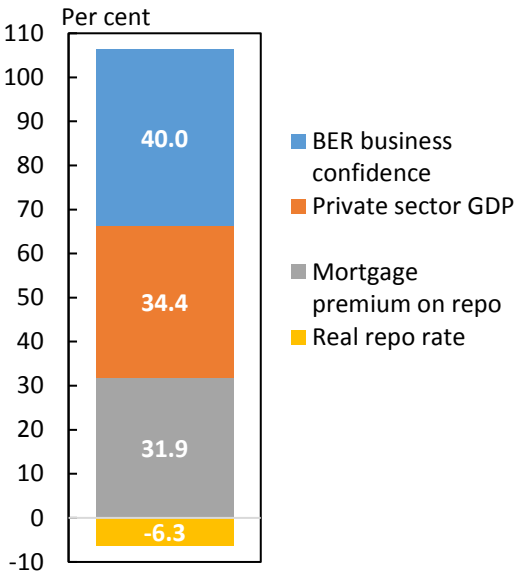


Figure 11: Cumulative deviation between actual and "normal" scenario



It is notable that due to the fact that the real repo was (often substantially) below the long run average in the post-2010 period, it has pushed the actual real credit extension marginally above where it would have been under "normal" circumstances. According to the estimated model, it would thus be difficult to argue that tight monetary policy over the post-2010 period has inhibited real credit extension growth. In fact, the opposite has happened – real credit extension growth has benefited from a real repo rate below the "normal" rate over the period.

We must emphasize that the model only measures the *direct* impact of the real repo rate on real credit growth outcomes. However, the real repo rate may also have had *indirect* effects on business confidence and real private sector GDP growth. To some extent, these would have been positive given how low the real rate has been since 2010. More recently, communications about a tightening cycle should have disincentivised borrowing to some degree – although the slow pace of rate increases might also have reassured borrowers that debt service cost growth would be contained. On the whole, the *indirect* effects are probably quite balanced.

Although further work on this may be required, our reading is that the slowdown in real credit growth is largely structural – with a higher mortgage premium as well as weaker business confidence and real private output suppressing real credit growth. Business confidence in particular might have been impacted by political and policy uncertainty, in turn negatively affecting investment and output. On the other hand, cyclical monetary policy was accommodative when compared to long run averages and has not meaningfully contributed to the post-2010 slowdown in real credit extension.

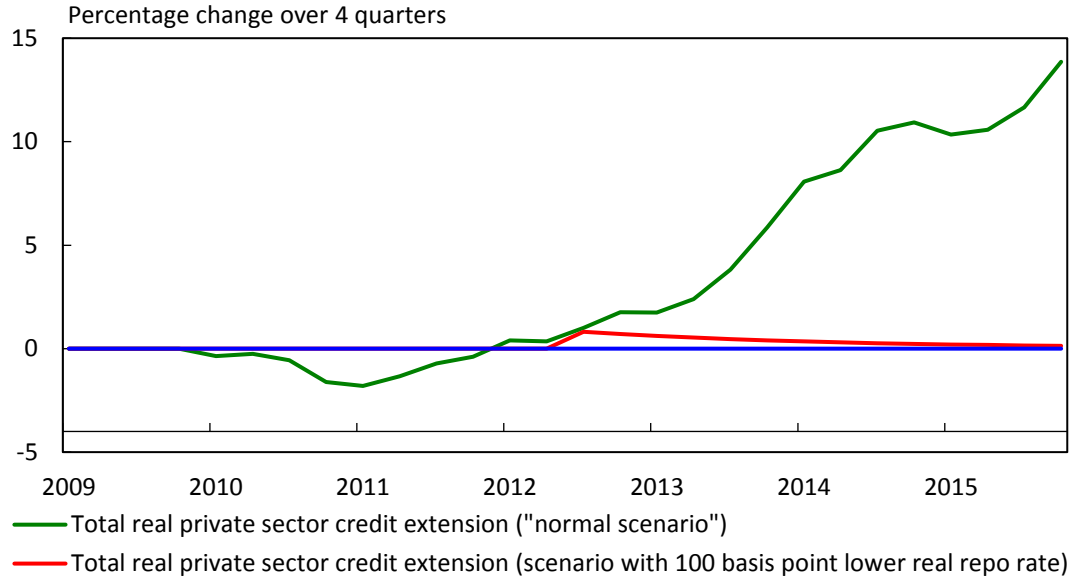
There was also greater emphasis on the regulatory environment in recent years which may have impacted not only on credit standards and banks' willingness to lend, but also the enthusiasm (optimism) of consumers to take up credit. For example, banks already started to phase in the requirements for Affordability Assessment, which were implemented as part of the revisions to the National Credit Regulations, in September 2015. It stipulates certain minimum living expense norms and credit providers have to ensure that the consumer has adequate income for the repayment with enough left to cover the stipulated minimum expenses.

Could a lower real repo have supported real credit growth?

Monetary policy was not part of the problem, but perhaps it could have done more to compensate for the other problems. To test this, we conduct an experiment where the real repo rate was 100 basis points lower than the actual repo rate from the first quarter of 2012.[10] According to the model, the benefits from a lower real repo rate take two quarters to work through the system, with real credit growth rising by 0,8 percentage points in the third quarter of 2012 when compared to the actual outcome. The effect then slowly dissipates, so that the cumulative impact falls to only 0,5 percentage points by the second quarter of 2013 and to less than 0,1 percentage points by the end of 2015. In terms of year-on-year credit growth, the 2012 impact is about 0,4 percentage points.

Figure 12 depicts both the scenario of a 100 basis point lower real repo rate from the first quarter of 2012 onwards and the earlier described "normal" scenario relative to the actual outcomes. It is clear that this more accommodative setting would have only marginally offset the impact from lower business confidence, slower private sector growth and the rising mortgage premium. In fact, according to the model, returning credit growth to "normal" would have required a decline in the real repo rate of 400 basis points[11], cumulatively, by the end of 2013, *ceteris paribus*.[12] Such a large fall in rates was never feasible; indeed, attempting it would probably have tightened financing conditions by ruining the credibility of monetary policy.

Figure 12: Comparing experiment with lower real repo rate and "normal" scenario with actual outcomes



10 In the model, the real repo rate does not play a role in the equilibrium level of real credit growth, but only affects the dynamics (or the cycle) around the equilibrium. This is analogous to interest rates not determining potential GDP, but rather only affecting the cycle around potential GDP.

11 Obviously this can be a combination of a lower nominal repo rate and higher inflation.

12 This assumes the other factors remained fixed. Of course, GDP growth and business confidence would probably have shown a positive short-term response to rate cuts, boosting real credit (substantially). But even assuming these did some of the work, restoring 'normal' credit growth would still have required a real repo rate set several hundred basis points lower.

Concluding remarks

A simple econometric model suggests that real credit growth in South Africa may be largely explained by the mortgage rate premium, the real repo rate, business confidence and real private sector output. Real credit growth averaged 1,3 per cent p.a. over the 2010–2015 period. According to the estimated model, if the drivers of credit extension had been at their "normal" levels (i.e. 15 year averages), credit growth would have been 3,1 per cent p.a. – i.e. nearly 2 percentage points p.a. higher over the period. The bulk of this difference relates to structural factors – a rising mortgage premium, below average private sector GDP growth and most importantly significantly lower business confidence than observed historically. This was only marginally countered by accommodative monetary policy, with the real repo rate set at levels slightly below long run averages in the post-2010 period.

Annexure A: Equation for real private sector credit extension

Dependent Variable: DLOG(FCREDP1)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 02/09/16 Time: 14:37
Sample: 2002Q1 2014Q4
Included observations: 52
Convergence achieved after 49 iterations
Coefficient covariance computed using outer product of gradients
DLOG(FCREDP1) =C(1)*(LOG(FCREDP1(-1)) - (C(2)*LOG(YP1(-1)) +C(3)
*BCI(-1)/100 +C(4)*FMORTP(-0))) +C(5) +C(6)*D(FMORTP(-3)) +C(7)
*D(FREPOR(-2))

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.129804	0.054490	-2.382179	0.0215
C(2)	1.913199	0.244965	7.810081	0.0000
C(3)	0.558946	0.302165	1.849805	0.0709
C(4)	-0.151388	0.067411	-2.245753	0.0297
C(5)	-1.712699	0.699676	-2.447848	0.0183
C(6)	-0.031611	0.013062	-2.420047	0.0196
C(7)	-0.008116	0.001939	-4.184635	0.0001

R-squared	0.558763	Mean dependent var	0.010800
Adjusted R-squared	0.499932	S.D. dependent var	0.027516
S.E. of regression	0.019458	Akaike info criterion	-4.916463
Sum squared resid	0.017038	Schwarz criterion	-4.653795
Log likelihood	134.8280	Hannan-Quinn criter.	-4.815762
F-statistic	9.497680	Durbin-Watson stat	2.103520
Prob(F-statistic)	0.000001		

Where:

FCREDP1 Real private sector credit extension (deflated with GDP deflator)

YP1 Real private sector GDP (i.e. GDP at market prices excluding government consumption and investment spending)

BCI BER business confidence index

FMORTP Mortgage premium on repo rate

FREPOR *Ex ante* real repo rate (based on household consumption deflator six quarters ahead)

All about that base? Assessing the role of base effects in South African CPI inflation – November 2016[1]

Thulisile Radebe & David Fowkes

Abstract

The South African trade balance has improved significantly over the last three years from a 2.1 per cent of GDP deficit in 2013 to an estimated 0 per cent in 2016. According to the model developed in this note, roughly three-quarters of this improvement is cyclical and one quarter structural. If the export and import drivers were at their equilibrium (or structural) levels in 2016, the trade balance would have been -1,3 per cent of GDP – instead of the estimated 0 per cent. The trade balance could therefore deteriorate again should export and import values return to their trend values.

Introduction

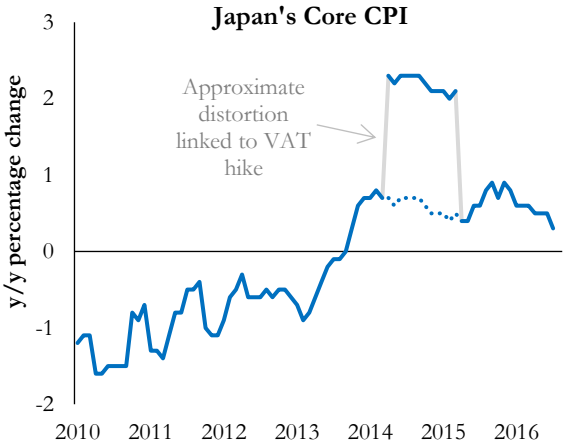
2015 proved to be a good year for South African inflation. Headline CPI inflation reached a five-year low of 4.6%,[2] close to the mid-point of the target range, largely due to petrol price deflation.[3] In 2016, by contrast, inflation has breached the upper-end of the 3–6% target range, and is expected to average 6.4% for the year. The contrast between relatively low inflation in 2015 and relatively high inflation in 2016 suggests base effects are to blame. If so, the target breach may be a statistical mirage.[4] However, it is also possible higher inflation in 2016 reflects 'real' or contemporaneous inflation, from factors such as costlier food and lottery tickets.

To quantify these effects, we rely on a rolling sum approach based on monthly inflation rates, similar to that used by the European Central Bank.[5] Our results suggest base effects in 2016 were large enough to explain the target breach. However, base effects are in turn also responsible for inflation returning to target in 2017. The estimates are quite sensitive to specific choices around specifying whether a month's inflation rate is unusual or not, and as such these quantifications should be used with caution.

[1] Many thanks to Byron Botha, Franz Ruch, Rudi Steinbach, Siobhan Redford, Pamela Mjandana, Shaun DeJager, Shaista Amod, and Elmarie Nel for their valuable comments.
[2] Unless otherwise indicated, inflation numbers refer to year-on-year increases.
[3] Note that although food price increases were relatively supressed in 2015 due to the bumper crop in 2014 (of about 14.25 million tonnes), the largest contributor to the downward swing in headline CPI was from petrol prices.
[4] This possibility is raised in the research department's MPC post mortem for July 2016 "…the current outlook is strongly dominated by a *base effect* for the 2016 forecast due to inflation having been close to the mid-point in 2015, largely as a result of a decline in oil prices during that period. An important question is to establish how much of the increase in the inflation outlook is simply a *base effect* or mechanical, and how much of it has some measure of persistence embodied in it largely as a result of supply shocks that continue to persist for longer than expected…" (emphasis added).
[5] See European Central Bank (January 2005), "Base effects and their impact on HICP inflation in early 2005", Monthly Bulletin (Box 3: pg. 33 – 25). Available at: https://www.ecb.europa.eu/pub/pdf/other/mb200501_focus03.en.pdf

The base effect problem

A base effect occurs when a comparison between two data points creates the impression of a change in the more recent data point that is actually caused by a shift in the starting point. Base effects can cause dramatic moves in inflation rates, and may therefore be important for policymakers. For example, in April 2015 core inflation in Japan fell from 2.1% to 0.4%. This was not due to a disinflationary shock which struck the economy that month. Rather, the drop in inflation was entirely due to an increase in the VAT rate implemented in April 2014, a point of comparison that dropped out of the year-on-year inflation calculation in 2016.

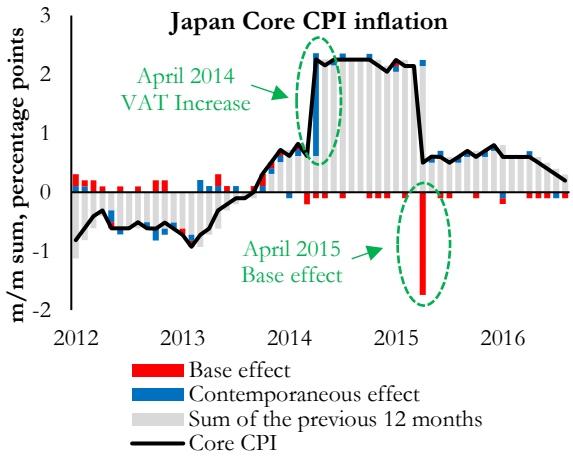


Method

To quantify base effects, we use a rolling sum approach. This relies on the fact that the sum of month-on-month changes in headline CPI during a particular year is approximately equal to the overall year-on-year percentage change in inflation. (For instance, a year-on-year rate of 6% inflation would follow from 12 months of 0.5% inflation.) As the rolling sum continues from time t to t+1, one month drops out of the sum and a new one is added. Any changes in CPI inflation from time t to t+1 can either be attributed to the first month falling away (the 'base effect') or the new month being added (a 'contemporaneous effect').

Of course, it would be unrealistic to treat the entirety of the departing month as a base effect, because then there would persistent base effects even in an economy with completely stable inflation. It would also be incorrect to subtract the incoming month from the outgoing month, as this would make it impossible to distinguish base effects from contemporaneous effects. Rather, this method requires some gauge of 'normal' inflation which can be subtracted from the new and old months to quantify the contemporaneous and base effects. The scale of the base effect is therefore measured as the difference between the average month-on-month rate and the departing number.[6] The base effect for the overall year is the cumulative sum of each base effect over the 12-month period.[7]

This approach works well for our Japan example. Using the 12-month rolling-sum, and an average over the period 2010-date, we find that the April 2014 VAT increase contributed approximately 1.7pp to a core CPI inflation rate of 2.2%. This increase then remained in the core CPI calculations for the next 11 months, before falling out in April 2015, when inflation slumped to 0.5%. In this case, the base effect is therefore 1.7%. This example also illustrates why it is necessary to use a cumulative sum, not just an average, when calculating the base effect. Note that the original April 2015 VAT increase features as a contemporaneous effect just once. Thereafter, contemporaneous effect are very small, reflecting new inflation shocks. However, to understand why inflation remained over 2% until April the next year, the legacy of the VAT increase is crucial. An average for the 12 month period would give a contemporaneous effect of just 0.1, leaving the year-long 'hump' in Japanese inflation a mystery.

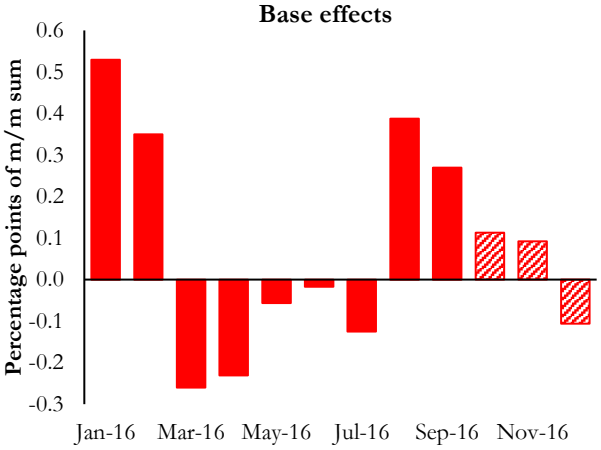


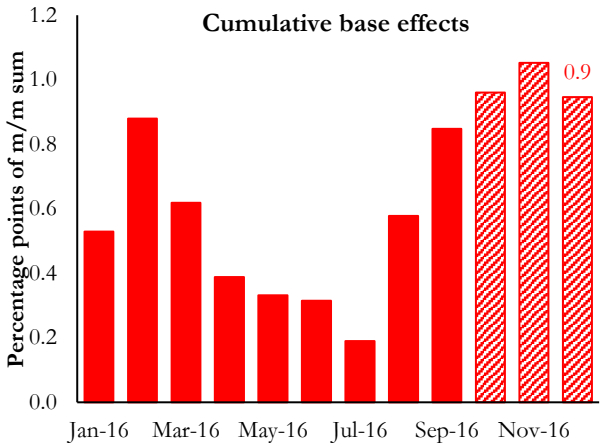
[6] See appendices.
[7] This follows an ECB methodology: see European Central Bank (February 2013), "Base effects and their impact on HICP inflation in 2013", Monthly Bulletin (Box 5: pg. 48 – 49). Available at: https://www.ecb.europa.eu/pub/pdf/other/mb201302_focus05.en.pdf

The same applies to the base effect over the following year.

Results

For South Africa, this methodology suggests the total base effect for 2016 was 0.9pp. Much of this comes from January and February 2016, with another large positive contribution in August and September. Both of these episodes reflect petrol price declines a year earlier. There are also some months with negative base effects, particularly during the second quarter. One explanation for these is changes in the petrol and RAF levies, with large increases in 2015 (80.5c) giving way to smaller increases in 2016 (30c).





It is worth noting that the 12 months comprising 2015 do not perfectly correspond with the oil shock. Rather, we see negative contemporaneous effects from September 2014, which then become positive base effects from late 2015. As a result, the twelve months from September 2015 to August 2016 have base effects of 1.6pp, substantially (0.7pp) more than for the calendar year 2016.

There are also positive contemporaneous effects for 2016, totalling 0.6pp. These reflect shocks such as higher food prices, vehicle prices and lottery tickets. As these contemporaneous effects are reversed in 2017, they become a base effect of -0.6pp. Without this base effect, headline inflation would not be subsiding below 6.0% in 2017.[8]

The most important objection to this technique is that the average used to quantify 'abnormality' is to some extent arbitrary. The results reported above rely on the average monthly rate of change for the seasonally adjusted targeted measure of inflation for the period 2000 to 2014 (that is, the inflation targeting period excluding the period under investigation). However, there are plausible alternative choices which would give quite different results.

Rationale	Period	m/m average	2016 base effect
Targeted inflation for entire inflation targeting period	Feb. 2000 - Sep. 2016	0.50	0.9
Since adoption of headline CPI as target inflation	Jan. 2009 - Sep. 2016	0.44	0.2
Post-crisis to date	Sep. 2009 - Sep. 2016	0.43	0.1
Post-crisis incl. forecasts	Sep. 2009 - Dec. 2018	0.45	0.3
IT period pre-2015	**Feb. 2000 - Dec. 2014**	**0.50**	**0.9**

One possible response to this problem is scepticism. Given answers ranging from minor (0.1pp in 2016) to substantial (0.9pp), it may be best to downplay the importance of base effects. Another response is to prefer one average to another, and trust those results. An advantage of the higher monthly average numbers is that they more closely approximate what seems to be the *de facto* inflation target.[9] The monthly averages

[8] All forecasts are based on the Disaggregated Inflation Model – August 2016 forecast.
[9] Nir Klein (2012) "Estimating the Implicit Inflation Target of the South African Reserve Bank" *IMF Working Paper 12/177*, available at: https://www.imf.org/external/pubs/ft/wp/2012/wp12177.pdf; Alain Kabundi, Eric Schaling

which give us higher base effect numbers entail annual inflation rates close to 6.0%.[10] The lower monthly averages, by contrast, imply annual inflation between 5.2% and 5.5%. Furthermore, the time periods which generate the lower numbers are shorter and include two significant disinflation shocks: the aftermath of the Great Recession and the oil price collapse, which biases them downwards. Our interpretation is that there are better reasons to use a monthly average around 0.5 than the other numbers considered above.

Conclusion

Base effects have led to higher measured inflation in 2016. Our methods indicate they added about 0.9pp to headline inflation, and this number would have been larger had the oil price collapse coincided more perfectly with the 2015 calendar year. However, 2016 outcomes also reflect contemporaneous movements in prices for food and core items, which contribute around 0.6pp to inflation. As these food and core shocks drop out of the base, they will flatter the 2017 inflation rate by the same magnitude. This figure is large enough to explain why inflation shifts back within the target range in 2017.

and Modeste Some (May 2016) *SARB Working Paper 16/05*, available at:
http://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/7277/WP1605.pdf

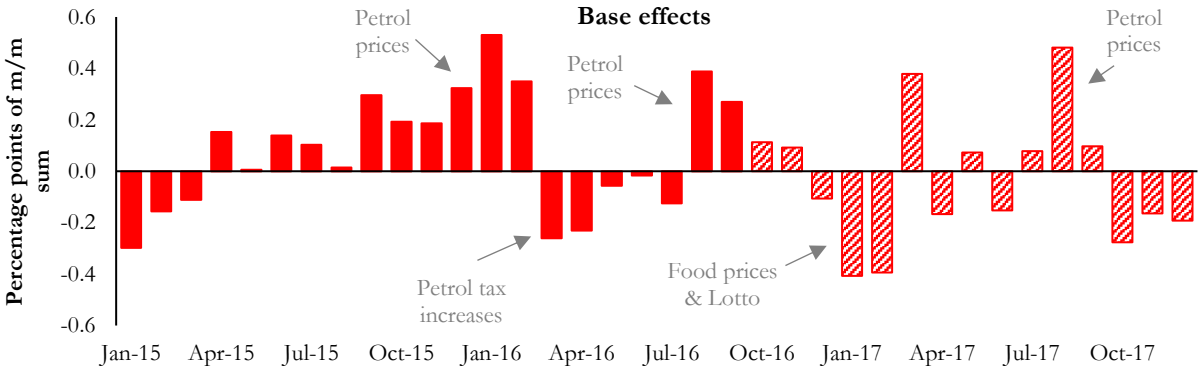
[10] Because the oil shock lowered inflation, a higher average number will create a bigger gap between actual and normal inflation, and therefore a larger base effect in 2016.

Additional materials

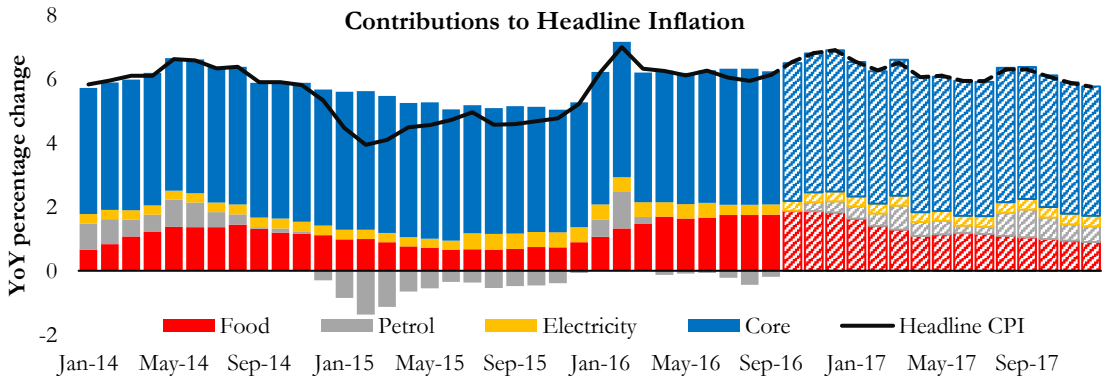
Base effects over time:

	Contemporaneous effect	Base effect
2007	2.2	1.1
2008	3.9	-2.2
2009	0.1	-3.9
2010	-2.6	-0.1
2011	-0.2	2.6
2012	-0.5	0.2
2013	-0.7	0.5
2014	-0.8	0.7
2015	-0.9	0.8
2016	0.6	0.9
2017	-0.4	-0.6

Base effects by month:



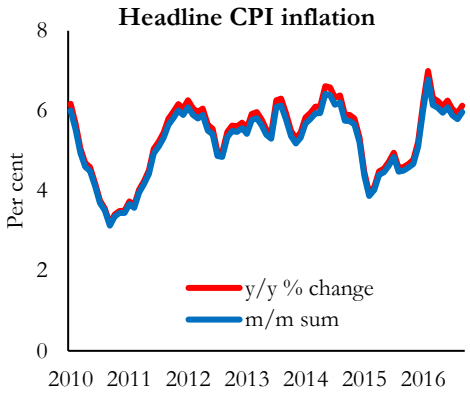
Headline CPI Contributions:



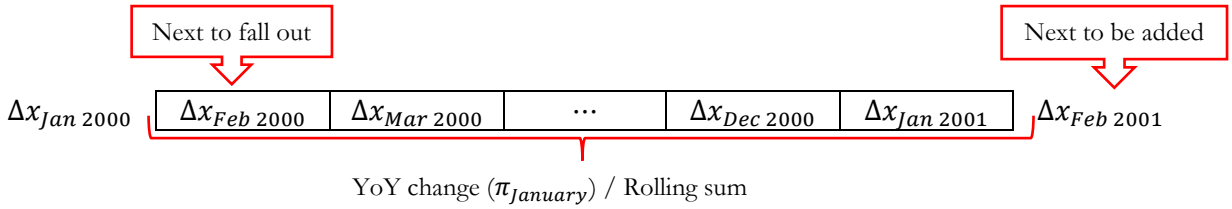
Appendix A: Base effects (12-month-rolling-sum perspective)

CPI inflation is measured on a year-on-year basis which loosely means that it contains the inflation pressures over the past 12 months. This is a good idea because it makes the definition of inflation conform to the intuitive notion that the inflation process is smooth (not volatile), however, it has the side effect that it can only contain 12 months' information[11], and so as you move forward some information must drop out. Mathematically it can be shown (see the technical appendix) that:

$$\pi_t \cong \sum_{i=1}^{12} \Delta x_{t-12+i}$$



The above simply says that the current inflation rate is equal to the sum of the past twelve months' month-on-month changes (in the level of the CPI price level). Here is a visualisation of the dropping out of the 12th month month-on-month change as you move from $\pi_{January}$ to $\pi_{February}$:



The distortion of the inflation rate due to the dropping out of this old information (which can be justified as no longer contributing to future inflation pressure) is called the base effect and it explains the pickups and falls mentioned earlier. This leads to the more accurate description of a change in the inflation rate:

$$\pi_{Feb\ 2001} - \pi_{Jan\ 2001} \cong \Delta x_{Feb\ 2001} - \Delta x_{Feb\ 2000}$$

And by taking the previous (January) inflation rate to the other side of the equals sign we now have a neat way of breaking up a given month's inflation rate:

$$\pi_{Feb\ 2001} \cong \pi_{Jan\ 2001} + \Delta x_{Feb\ 2001} - \Delta x_{Feb\ 2000}$$

That is, the inflation rate in February is equal to the inflation rate in January plus the growth added in February minus the growth last February which is no longer counted. We are not yet ready to give a formal definition of a base effect, because we want to separate what we intuitively think of as driving current inflation from the distortionary base effects. To do this we insert a wedge in between the two in the form of the average month-on-month change over a period to get:

[11] 12 months is not an arbitrary number of months since the seasons span 12 months, using 12-month inflation rates tends to average out seasonal patterns.

$$\pi_{Feb\ 2001} \cong \pi_{Jan\ 2001} + (\Delta x_{Feb\ 2001} - \overline{\Delta x}) - (\Delta x_{Feb\ 2000} - \overline{\Delta x})$$

So that we end up with the inflation rate in February being equal to the inflation rate in January plus the growth above the average growth added in February, minus the growth above the average growth last February which is no longer counted. In this way only above average growth and distortionary effects are taken into account and we end up with an intuitive definition of a base effect. A base effect is thus the contribution to the change in the rate in inflation that comes from month-on-month growth rates that deviate from an amount in excess of the average dropping out of the base.

Appendix B: Technical appendix

The approximate equivalence of the product and sum of small changes

For small changes in x and y:

$$\Delta xy = \frac{x_1 y_1 - x_0 y_0}{x_0 y_0}$$

$$\Delta xy = \frac{x_1 y_1}{x_0 y_0} - 1$$

$$\Delta xy = \left(\frac{x_1}{x_0}\right)\left(\frac{y_1}{y_0}\right) - 1$$

$$\Delta xy = (1 + \Delta x)(1 + \Delta y) - 1$$

$$\Delta xy = 1 + \Delta y + \Delta x + \Delta x \Delta y - 1$$

$$\Delta xy = \Delta y + \Delta x + \Delta x \Delta y$$

$$\Delta xy \cong \Delta y + \Delta x$$

Since

$$\Delta x \Delta y \cong 0$$

The approximate equivalence of small year-on-year changes with the sum of the past 12 month-on-month changes

Thus for $\Delta_{12} x_t$ (year-on-year change):

$$\Delta_{12} x_t = \frac{x_t - x_{t-12}}{x_{t-12}}$$

$$\Delta_{12} x_t = \frac{x_t}{x_{t-12}} - 1$$

$$\Delta_{12} x_t = \frac{x_{t-11}}{x_{t-12}} \cdot \frac{x_{t-10}}{x_{t-11}} \cdots \frac{x_{t-1}}{x_{t-2}} \frac{x_t}{x_{t-1}} - 1$$

$$\Delta_{12} x_t = \Delta x_{t-11} x_{t-10} \cdots x_t$$

$$\Delta_{12} x_t \cong \sum_{i=1}^{12} \Delta x_{t-12+i}$$

Decomposing changes in year-on-year inflation into growth and base effects

It follows directly from the second result that

$$\Delta_{12} x_t \cong \Delta_{12} x_{t-1} + (\Delta x_t - \Delta x_{t-12})$$

Rearranging gives

$$\Delta_{12} x_t - \Delta_{12} x_{t-1} \cong \Delta x_t - \Delta x_{t-12}$$

If the average month-on-month growth rate is $\bar{x}_t$,

Then we can rewrite the previous equation as

$$\Delta_{12}x_t - \Delta_{12}x_{t-1} \cong +(\Delta x_t - \Delta x_{t-12}) + \bar{x}_t - \bar{x}_t$$

Rearranging gives

$$\Delta_{12}x_t - \Delta_{12}x_{t-1} \cong (\Delta x_t - \bar{x}_t) - (\Delta x_{t-12} - \bar{x}_t)$$

Which gives us the following two definitions

$$growth\ effect \cong (\Delta x_t - \bar{x}_t)$$

$$base\ effect \cong -(\Delta x_{t-12} - \bar{x}_t)$$

Analysis and revisions to the food outlook based on the Disaggregated Inflation Model (DIM) – November 2016[1]

Janine Boshoff and Byron Botha

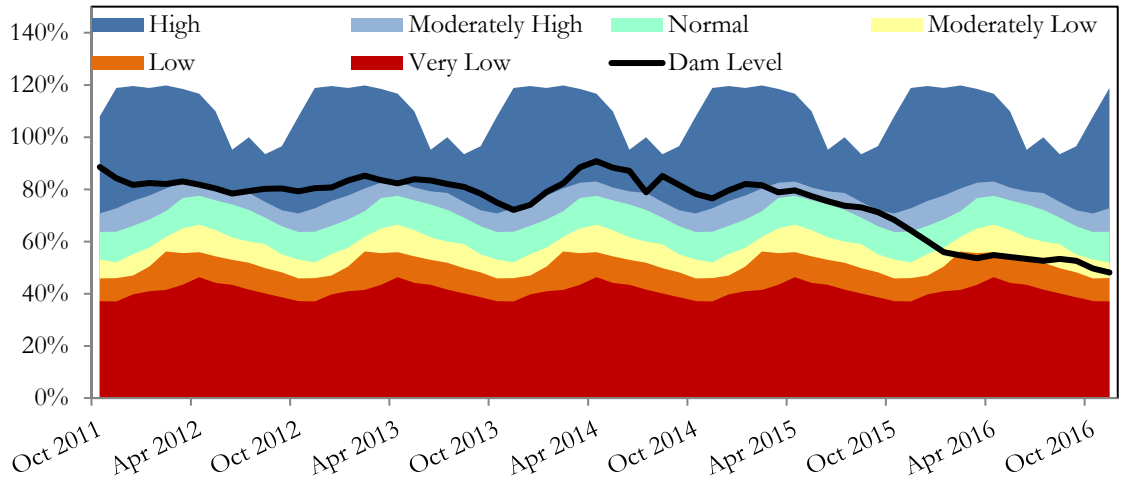
Abstract

In light of recent data outcomes and the importance of food in the calculation of headline consumer price inflation, it has been necessary to gain a deeper understanding of the dynamics in the agricultural sector following the recent drought. Approaching the problem on a disaggregated level we look at the industry category by category. The note concentrates on changes to the outlook on meat products in order to develop a view of food price inflation over the medium term. The analysis indicated that the timing and extent of the drought's impact on subcategories of Agricultural products differ significantly. This called for a revision to the forecast for the CPI Food basked, and as a result, the forecast prepared for the November 2016 MPC round differs significantly from the forecast prepared in September 2016. Finally, the impact of the current drought has been relatively muted when compared to historical drought periods.

Introduction

The South African agricultural sector experienced the lowest levels of rainfall[2] on record since 1904 over the 2015/16 season. Based on data collected by the Water and Sanitation department[3], dam levels across South Africa, Lesotho and Swaziland are at five year lows. A return to normal rainfall conditions in 2017 would likely have only a moderate impact in replenishing reservoirs, and the outlook suggests that dam levels will remain at historically low levels in the medium term, despite recent rains. While the impact of the drought has been pervasive, the extent and timing differs between the various subsectors of agriculture.

Figure 1. Historical dam level trends
Capacity (%)



[1] The authors would like to thank all the reviewers of this work as well Dineo Lekgeu and Jeffrey Rakgalakane for their contributions in particular. The outlook with respect to the tables and quoted figures represents the view presented at the November MPC while the graphs include the data updated with the October 2016 CPI release.
[2] Bureau for Food and Agricultural Policy (BFAP). (2016). *Agricultural Outlook 2016 – 2025*.
[3] Department of Water and Sanitation. (2016). National Integrated water information system. [Online]. Available: http://niwis.dwa.gov.za/niwis2/SurfaceWaterStorage. Accessed: 15 October 2016.

In determining the likely effects of the drought going forward, we must be cognisant of current weather developments, which will have a material impact on the production and price outlook. The reason for stressing the importance of weather conditions in the upcoming season is that the high ocean temperatures[4] that played a large role in causing the drought are known to decline quite rapidly after reaching a peak, thus oscillating from the warm El Niño to the cooler La Niña weather pattern. The South African Weather Service noted[5] that their forecasts for above average summer temperatures had subsided concurrently with expected wetter conditions over the early-to-midsummer period. Historical weather patterns notwithstanding, they cautioned that the lack of strong evidence of the development of La Niña to date casts considerable doubt on a favourable weather outlook. As a result, our baseline view is that South Africa will experience normal rainfall in the 2016/17 and 2017/18 seasons.

The rest of the note proceeds with a forecast of the inflation rate of the consumer food basket (CPI food inflation). The evolution of the food price forecast in 2016 represents a significant departure from previous forecasts, due largely to a change in the meat products inflation forecast which is subsequently examined. The primary interest is the ultimate effect of these changes on consumer prices and uncovering the dynamics of how the agricultural prices transmit to consumer prices.

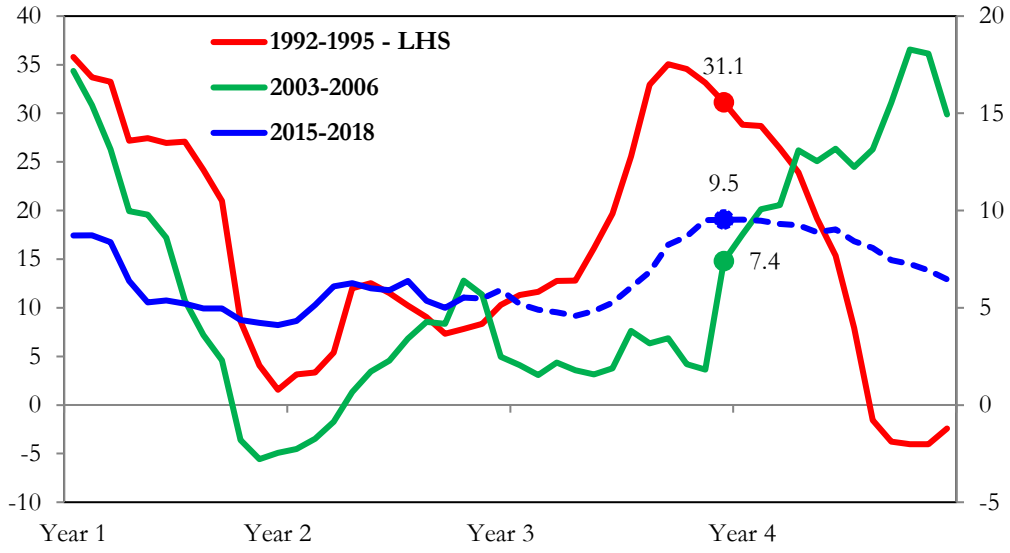
Overview and evolution of the food forecast

The food price outlook is sensitive to a number of assumptions concerning likely weather developments, the strategies and technologies available to farmers (in an ever changing, globalised world), and consumer preferences. We have used historical event data and relied on the analysis of agricultural organisations and think tanks to construct what we feel is the most likely drought recovery scenario given the data so far.

In the end however no two drought events are ever the same as consumers and producers can behave unpredictably, with small changes often having large impacts, and technology and agricultural policy continually altering the constraints of farmers[6]. Figure 2 shows the development of meat price inflation during various drought episodes in recent history. Particularly striking is the reduction of amplitude of the inflation, but similar dynamics in each drought episode. Thus, while there is enough regularity in the data to give some confidence to our forecast it is important to remember how quickly things can change. Should cattle farmers decide to take advantage of recent rains, for example, and start herd rebuilding early, meat prices pressures could shift forward and change the outlook quite dramatically.

[4] Measured by the Oceanic Niño Index (ONI).
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml
[5] Seasonal Climate Watch November 2016 to March 2017, Date: 20 October 2016.
http://www.weathersa.co.za/media/data/longrange/gfcsa/scw.pdf
[6] For example, the South African maize industry was deregulated in 1997 and the GMO Act introduced in the same year which opened the way for genetically modified mielies (making the crop more pest and drought resistant) resulting in much smaller price swings since the 2000s.

Figure 2. Meat prices following drought periods
Per cent (year-on-year)



This is essentially what has happened (albeit in reverse) from the previous to the current MPC, meat price pressures in the beginning of 2016 were expected to build up to the eventual peak, but ultimately fizzled out in the second half of the year. As a result meat now peaks in 2018Q1 at 9.5 per cent whereas it previously peaked at 9.9 per cent in 2017Q1. The complete results are summarised in Table 1.

Table 1. Disaggregated food price forecast November 2016 MPC vs September 2016 MPC

Forecast	Weight	2015	Q1	Q2	Q3	Q4	2016	Q1	Q2	Q3	Q4	2017	Q1	Q2	Q3	Q4	2018
Food and NAB	15.41	5.1	8.3	10.8	~~11.6~~	~~12.3~~	~~10.8~~	9.6	~~7.4~~	~~7.0~~	~~5.6~~	~~7.4~~	NA	NA	NA	NA	NA
					11.3	11.3	10.5	8.2	5.7	5.8	6.0	6.4	6.6	7.1	6.9	6.8	6.8
Meat	4.56	5.9	5.2	6.1	~~7.0~~	~~9.6~~	~~7.0~~	~~9.9~~	~~9.5~~	~~8.8~~	~~7.1~~	~~8.8~~	NA	NA	NA	NA	NA
					5.6	5.6	5.6	4.9	4.8	7.0	9.3	6.5	9.5	9.2	8.1	7.0	8.4
Bread and cereals	3.55	5.0	10.8	14.7	~~15.2~~	~~15.7~~	~~14.1~~	~~11.7~~	~~7.9~~	~~6.8~~	~~5.5~~	~~7.9~~	NA	NA	NA	NA	NA
					15.9	17.0	14.6	12.0	6.3	4.1	2.7	6.1	3.9	5.6	6.1	6.1	5.4
Dairy	1.74	6.1	~~2.7~~	~~6.7~~	~~9.9~~	~~11.8~~	~~7.8~~	~~12.1~~	~~8.7~~	~~6.7~~	~~5.8~~	~~8.2~~	NA	NA	NA	NA	NA
					9.6	10.9	7.5	11.1	7.7	5.9	5.6	7.5	6.2	7.3	7.6	7.7	7.2
Vegetables	1.61	0.8	~~18.1~~	~~20.9~~	~~15.6~~	~~11.9~~	~~16.6~~	~~2.2~~	~~0.3~~	~~6.2~~	~~4.0~~	~~3.1~~	NA	NA	NA	NA	NA
					15.0	10.1	16.0	-0.2	-2.2	4.2	5.4	1.7	5.7	5.5	5.2	5.2	5.4

As is evident from the table, the largest revision occurred to the meat category. Recent downward surprises called for additional research to be conducted into the trend of meat prices.

Meat

OECD-FAO[7] estimates indicate that global meat production is expected to expand by approximately 16 per cent over the 10-year forecast period. Global production has benefited from persistently low grain feed prices over the past three years. Conversely, the domestic livestock sector has been hampered by adverse weather conditions, while the recent currency depreciation means importing feed alternatives has

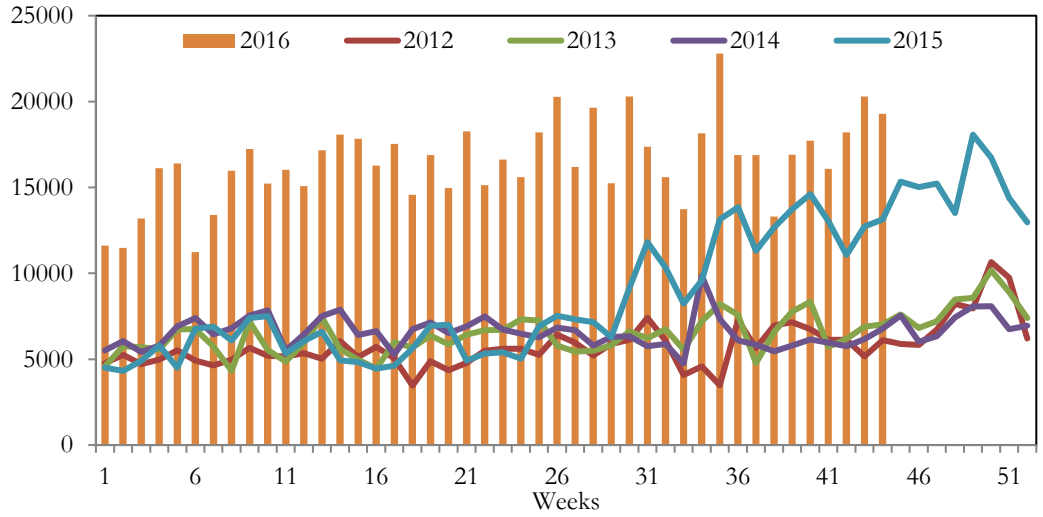
[7] Organisation for Economic Cooperation and Development & Food and Agriculture Organization of the United Nations (2015). "OECD-FAO Agricultural Outlook 2015". OECD Publishing, Paris.

become more costly. The impact of the 2015/16 drought has had a diverging impact on the livestock subsectors due to differences in production cycle length, feed use intensity, and price formation.

1. Beef production

Since the beef industry is largely dependent on grazing, it has been critically affected by the domestic drought conditions. In response, cattle slaughters numbers increased during the latter part of 2015 and cow herds are estimated to have declined by 15 per cent[8] compared to 2013 levels. Cattle slaughter trends have remained elevated during 2015 and 2016, and volumes have intensified further[9], well above those recorded in 2015.

Figure 3. Cattle slaughter trends
Heads of cattle



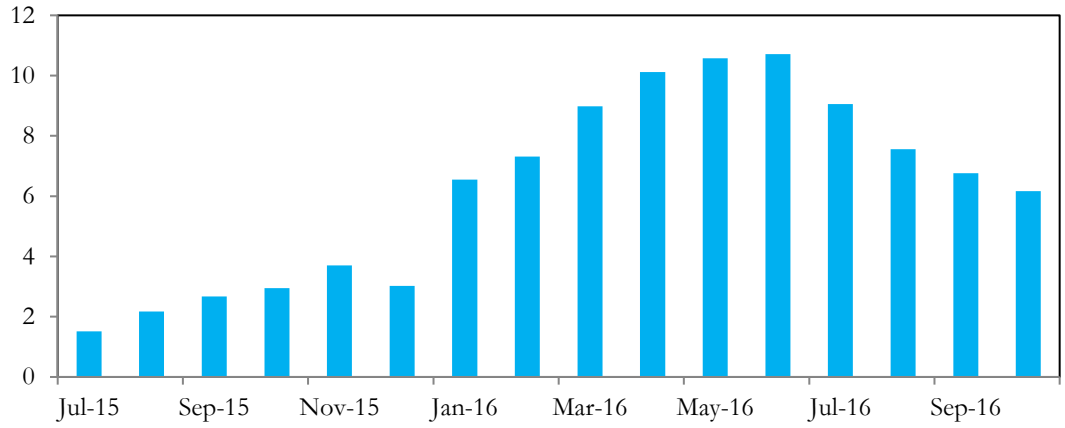
During previous drought episodes, herd liquidation resulted in lower beef prices in the short term, with a sharp uptick in prices when producers rebuilt herds later on. However, after South Africa regained its foot-and-mouth disease (FMD)-free status in 2014, red meat exports to Africa, Asia and the Middle East increased rapidly. Strong export demand, supported by the depreciation of the exchange rate, has limited the impact of domestic over-supply and supported average beef prices. As is evident from the graph below, domestic consumers have been facing consistently rising prices[10] since July 2015, despite slaughter volumes increasing by an estimated 9 per cent (BFAP, 2016).

[8] Bureau for Food and Agricultural Policy (2016). BFAP Baseline: Agricultural Outlook, 2016-2025. [Online]. Available at: http://www.bfap.co.za/documents/baselines/BFAP_Baseline_2016.pdf. Accessed on: 05 September 2016

[9] First National Bank (FNB). (2016). FNB Agri-Weekly. [Online]. Available: https://www.fnbagricomms.co.za/Agricweekly.aspx. Accessed: 16 November 2016.

[10] Statistics South Africa (2016).

Figure 4. Acceleration in CPI domestic beef prices
Year-on-year percentage change



The Red meat Producers Organisation (RPO)[11] suggest that national beef prices could increase by as much as 12 percent by the end of 2016, while the BFAP estimate that nominal prices will increase by an annual average of 5.8 per cent over the next decade. The change in export dynamics, in conjunction with higher maize feed prices, will cause a sharp increase in domestic prices when producers begin their herd rebuilding phase in 2017. Given the lengthy lifecycle of cattle production (approximately 4 years), domestic prices are expected to remain elevated, peaking in early-2018 before domestic supply stabilises in 2020. The BFAP (2016) have a similar price trajectory over their forecast period due to a reduction in slaughter volumes in 2017 and 2018.

2. Poultry production

The impact of the drought on production volumes has been less severe in the poultry industry. Intensive[12] use of feed grains[13] increased producer costs, but competitively priced imports have constrained the extent to which domestic producers can pass off costs to consumers.

The South African Poultry Association (SAPA) reported that imports increased by 21.6 per cent in 2015[14], and in fact, imports represent almost 23 per cent of domestic consumption (BFAP, 2016). Thus, domestic production volumes have held up well during the drought, but producer profits remain under pressure.

A return to normal weather conditions will produce a recovery in domestic production volumes by 2017, but the South African poultry market will continue to be characterised by a growing share of imported poultry. In an environment with stiff competition from importers (which may be exacerbated by the AGOA agreement), consumers will benefit from lower prices as domestic producers compete for market share.

[11] Farmer's Weekly (2016). Challenges and opportunities for SA's red meat producers. [Online]. Available at: http://www.farmersweekly.co.za/article.aspx?id=84461&h=Challenges-and-opportunities-for-SA%E2%80%99s-red-meat-producers. Accessed on: 17 October 2016.
[12] Feed costs account for 70 per cent of live bird costs.
[13] Parliamentary monitoring group (2016). Impact and Response to Current Drought. [Online]. Available at: https://pmg.org.za/committee-meeting/22102/. Accessed on: 17 October 2016.
[14] South African Poultry Association (2016). South African poultry meat imports: July 2016. [Online]. Available at: http://www.sapoultry.co.za/pdf-statistics/poultry-imports-report.pdf. Accessed on: 17 October 2016.

3. Pork production

Similar to the poultry industry, pork production systems are capital and feed intensive. Yellow maize composes the bulk of feeding systems[15], and producer profitability has been significantly impacted by the domestic drought.

While pork represents less than 8 per cent of meat consumption in South Africa, it remains an affordable alternative to both beef and lamb when consumed fresh. Processed pork, on the other hand, represents a high value-add category consumed predominantly by high income consumers where prices remain well supported despite the economic slowdown (BFAP, 2016).

Turning to the forecast, consumer prices are expected to peak in early 2018 as producers pass off some of the higher feed costs to the market. The spike in beef prices (due to herd rebuilding) in January 2018 will support pork prices as consumers opt to substitute to cheaper protein sources. Therefore, pork prices are set to remain elevated for the rest of the forecast period.

Since pork products make up the bulk of the dried, salted or smoked meat category, the DIM takes its cue from pork prices, adding on the premium for value-added in this category. The forecast for consumer prices of dried, salted and smoked meat is expected to peak in 2018, but remains elevated over the entire outlook.

4. Lamb and Mutton production

Production of lamb and mutton, which rely on a pasture based system, is very sensitive to weather conditions. South Africa imports a large proportion of its lamb products from New Zealand and Australia, meaning that market prices are affected by world price movements. Domestic producers with limited pastures have reduced their ewe flock, opting to retain younger replacement ewes for the rebuilding phase expected in 2017. The BFAP (2016) estimates that nominal lamb prices will increase by 5 per cent for 2016, led by import parity levels.

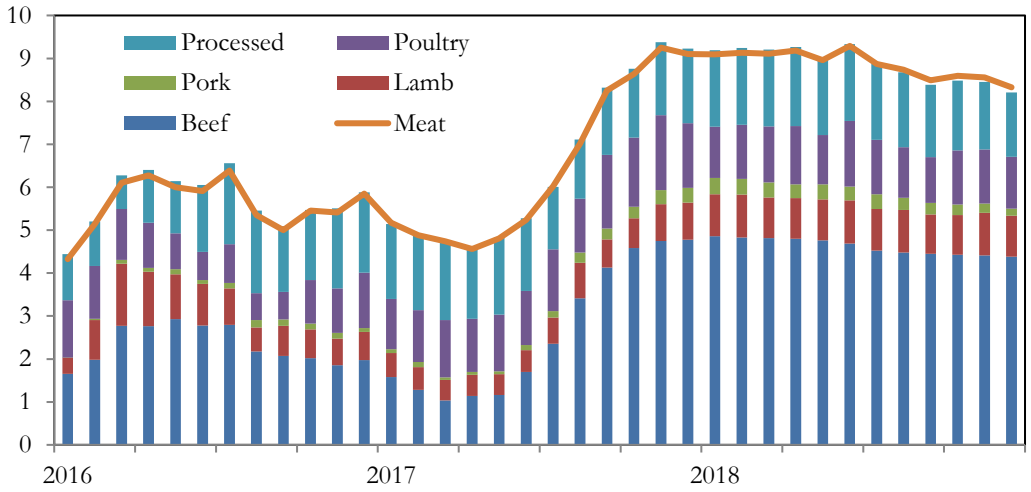
The production cycle for lamb and mutton is much shorter than that for beef, and an increase in production volumes are expected to occur in 2018 already. Once again, a spike in beef prices during the herd rebuilding phase will lend support to lamb and mutton prices as high income consumers substitute towards these products.

Forecast for Meat prices: Understanding the underlying trend

The individual forecasts for each of the components are combined to create a composite forecast for meat prices from 2016 to 2018. Thanks to a moderation in poultry and pork prices, meat prices are expected to average 5.6 per cent in 2016, down from 5.9 per cent recorded in 2015. Meat prices are expect to peak at 9.5 per cent in 2018Q1, but will remain elevated in the outer year of the forecast. This is predominantly due to the expected trend in beef prices, and subsequent price increases in other protein sources as consumers substitute towards relatively cheaper products. For this reason, meat prices are expected to average 6.5 per cent in 2017, increasing to 8.4 per cent in 2018.

[15] Feed costs represent 75 per cent of pork production costs.

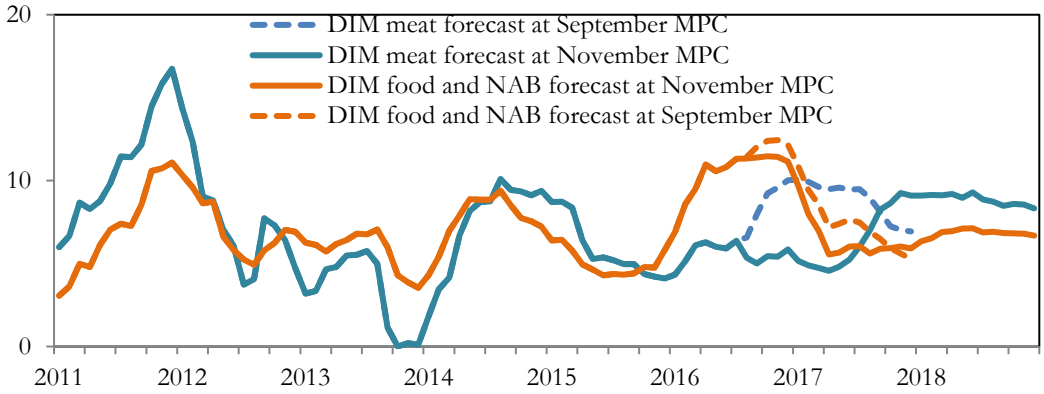
Figure 5. Composition of overall meat prices
Year-on-year percentage change



This represents a rather significant departure from the forecast produced in July 2016 (presented before the September MPC). The previous forecast expected the impact of the drought to become evident very early in the forecast period, and thus predicted momentum in meat prices in 2016. Lower-than-expected outcomes in the second half of the year called for a reconsideration of the underlying trends in meat prices.

For this reason, the forecast was updated to indicate the price pressures associated with the herd rebuilding phase in beef and the subsequent demand switch to pork and lamb. These three proteins constitute 41 per cent of total meat prices, and movements in these subcategories will likely dictate price dynamics for meat in total.

Figure 6. Revision of the outlook on meat and food (including NAB) prices
Per cent (year-on-year)



The revised meat forecast brings down the peak in total food & non-alcoholic beverages CPI by about 1.2 percentage points. At the November MPC, the trend peaked at 11.3 per cent in both the third and fourth quarters of 2016, down from the 12.3 per cent for the fourth quarter in the September MPC. Revised with October 2016 CPI data, the fourth quarter now peaks at 11.6 per cent, driven mainly by an uptick in the vegetables category. Overall, food inflation is expected to average above 6 per cent throughout the forecast period, with a relative low mid-2017 of just under 6 per cent as the rising trend in meat and declining trend in cereals intersect.