Making sense of neutral real interest rates[1] - July 2017

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Abstract

Model-based estimations of neutral real interest rates are useful but have various limitations. Sifting through domestic and external variable drivers of neutral real rates remains a critical complement to those estimates. Assuming a decline in the growth rate of capital stock to account for negative productivity shocks or lower global growth, I arrive at a NRIR close to 2%. This lies somewhat above the central projection of model-based estimates. Even with a potential growth assumption of 0.5%, the real policy rate lies well below the neutral level. The negative rate gaps in each of the estimates should be placing upward pressure on economic growth and inflation.

Introduction

This short paper reviews estimations of neutral real interest rates for South Africa based on a range of methods established in the literature. I provide some perspective on the relevance of varying estimations and a rough estimate of where the neutral real rate currently lies.

The neutral real interest rate

A neutral real interest rate (NRIR) is the level at which real interest rates will settle once the output gap is closed and inflation is stable around the central bank's target. Actual economic growth rates should be near potential. The NRIR has an operational significance as a benchmark for assessing the policy stance. When real policy rates are above the NRIR, a positive output gap should be closing as economic growth slows, and vice versa.

There are two basic methods for estimating NRIRs. One is to take the prevailing global interest rate level and add to it the set of reasons for why the local rate should differ, expressed as a real risk premium. The other starts from the potential growth rate of the economy and then adds all the other factors that may matter.[2] This is done, most notably by Laubach and Williams, with the use of a catch-all 'z' factor.

Prior to the global financial crisis, South Africa's potential growth rate was estimated at about 3.5%. Currently, short term estimates of potential sit at about 1.3%, suggesting that shorter-term factors outweigh longer- term ones that should pull it up. Among the latter are demographic factors, saving and consumption behaviour, inflation and exchange rate trends, and distance from technological frontiers. Among the shorter term factors is the growth effects of fiscal policy and the impact of policy uncertainty. These are not clearly identified in the models, but should explain movements in country risk premia or the 'z' factor in the neutral rate.

Figure 1: The real interest rate

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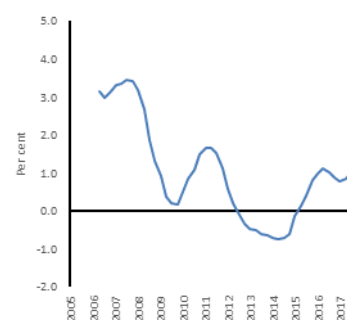
[1]   Many thanks to SARB staff for comments on multiple drafts.
[2]   See Knut Wicksell, Interest and Prices, 1898.
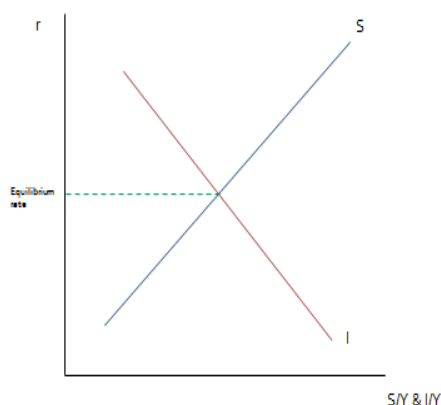
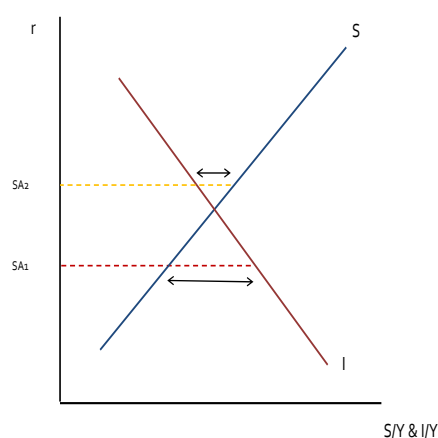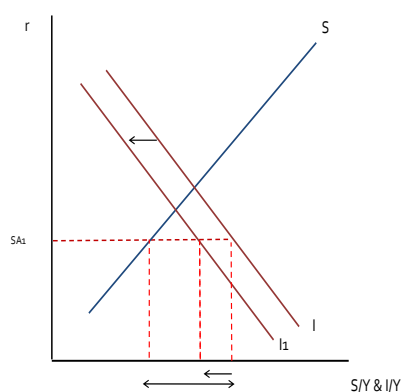**Figure 2: The basic NRIR and SI gap**

r

S

Equilibrium rate

I

S/Y & I/Y

Figure 3: Real policy rates and gaps

r

S

SA₂

SA₁

I

S/Y & I/Y

Figure 4: Global lower marginal product of capital, stable saving

r

S

SA₁

I

I₁

S/Y & I/Y

My general proposition is that for emerging-market economies in this post-crisis period, surplus global savings push down NRIRs, while structurally weak domestic savings and higher returns to capital pushes them back up.[3] Therefore, in the near term, NRIRs should be below long-term averages (of about 3.5%), but well above the levels applying in advanced economies (ranging from -0.5 to 0.5%).

Where investment-saving imbalances are sticky, where there is a higher inflation trend or weakening policy frameworks, a risk-based approach to real returns suggests neutral rates should be higher than otherwise. For instance, based on an average real US rate of 0,41 per cent and an average SA risk premium of 164 bps over the 2005 to 2016 period, the neutral rate for SA can be estimated at 2,05 per cent (Table 3 below).[4] Higher US real rates and larger country risk premiums would raise that estimate.[5]

Neutral rate estimates can vary widely. Hassan and Redford (H&R) establish a range with a low of -1.45 to a high of 1.7%. Ruch and Steinbach (R&S) separately identify a range of -0.3 to 2.9% for 2015. From an operational perspective, these ranges are too wide to tell us whether current policy is loose, tight or neutral. For example, if the real rate sits at 0.5% and the range allows for the NRIR to be anything from -1.0 to 1.5%, then the policy stance could be contractionary or expansionary. Some kind of narrow range or point is needed to make sense of the policy stance. An implicit averaging of differing estimates works against a clear use of the NRIR for communication and policy purposes.

Before discussion of the staff estimations, I look separately at how a basic investment-saving framework can be used to think about South Africa's neutral real rate level and how some constraints to growth affect potential.

The impact of saving and investment (SI)

The 'NRIR and SI gap' charts (Figures 2-7) show the relationship between the two most important determinants of the cost of capital, and will serve as a simple framework for looking at a couple of alternative scenarios. These relationships should be seen as medium-term determinants of the NRIR, rather than very long term.[6]

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[3]   This is more relevant for emerging market capital importers. Not all of them are, e.g. China.

[4]   As Fedderke and Pillay neatly show, risk moves and matters for the yield curve, while a purely expectations-hypothesis based approach that does not include risk, does not explain it well. See Fedderke and Pillay, "A theoretically defensible measure of risk: using financial market data from a middle income context", *ERSA Working Paper Number 64*, November 2007.

[5]   A risk-based approach is set out by Walter de Wet et al, "The balance between US real rates, South African country risk, and the real repo rate," Standard Bank, 24 January 2017

[6]   For a succinct overview of alternative short, medium and long run models see Vitorio Constancio, "The challenge of low real interest rates for monetary policy," Lecture at the Macroeconomics Symposium at Utrecht School of Economics, 15 June 2016. See also, Rhys R. Mendes, The Neutral Rate of Interest in Canada, Bank of Canada Discussion Paper 2014-5. September 2014, and also Joanne Archibald and Leni Hunter, What is the neutral real interest rate, and how can we use it, Reserve Bank of New Zealand, Bulletin, volume 64 No. 3 for applications of the investment-saving approach.

The basic idea is that investment to GDP (I/Y) and saving to GDP (S/Y) ratios are equilibrated by the real interest rate (Figure 2). If the real rate is above the equilibrium level, then a gap opens up between higher saving and lower investment or a negative gap closes.

In Figure 3, South Africa starts off with a real policy rate at level 'SA$_1$',[7] below equilibrium. Consequently, the economy exhibits a saving-investment imbalance (a current account deficit), shown by the red dotted line and displaying a gap measured on the horizontal axis between the saving to GDP and investment to GDP schedules. Raising the real policy rate above neutral (to SA$_2$) would create a current account surplus.

Global saving and investment conditions might affect South Africa as follows. With weaker potential growth, caused by a reduction in the marginal productivity of capital, I shifts to I$_1$. In the short run this lowers the warranted real level of interest (see Figure 4). The decline in productivity also reduces the pre-existing gap between saving and investment. At SA$_1$, the gap at the new investment schedule, I$_1$, is smaller than it would otherwise be. If South Africa's potential growth falls, but the real policy rate does not and the real interest rate gap (between the real rate and the neutral rate) becomes less negative, then the saving-investment gap closes faster (than would occur endogenously).

A rise in world saving has similar effects. Graphically, this shifts the domestic saving schedule to the right (Figure 5). Like a shift leftward in the investment schedule, a rise in saving lowers neutral real rates as more saving is available (NR old reduces to NR new). Also like a fall in investment, this reduces the size of a pre-existing negative saving-investment gap.

Combining a rise in saving with a fall in investment is the advanced economy diagnosis that motivates the argument for easing both fiscal and monetary policies. It is often supplemented with an argument for structural reform, on the grounds that fiscal policy either will not be enough to boost the productivity of capital or that many economies do not have fiscal space to expand deficits. Or that transmission channels for monetary policy are weakened and ineffective in boosting growth. [8]

How do global conditions improve our understanding of the current neutral rate in South Africa?

The following chart (Figure 6) represents current emerging-market conditions. The (representative) economy is subject to the decline in the global marginal product of capital, but also caught between a falling domestic saving rate and excess global saving. The net result of the opposing forces on available saving (negative domestic saving balanced by an offsetting net capital inflow) may be a net lower neutral real rate. At a
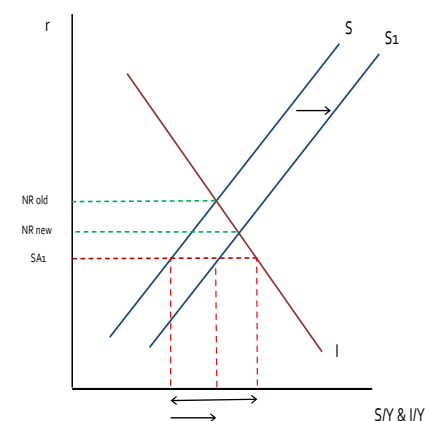
Figure 5: Global higher saving

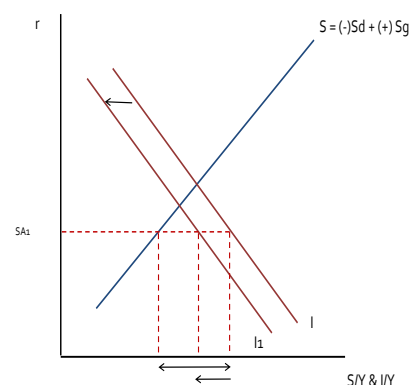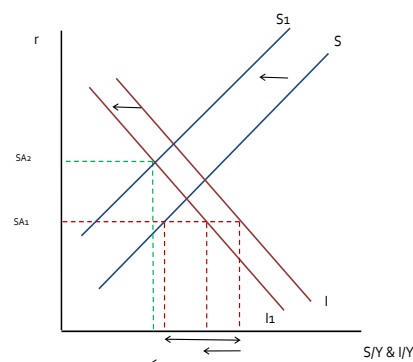**Figure 6: Global lower marginal product of capital, net stable saving**

Figure 7: Lower potential, lower global and domestic saving

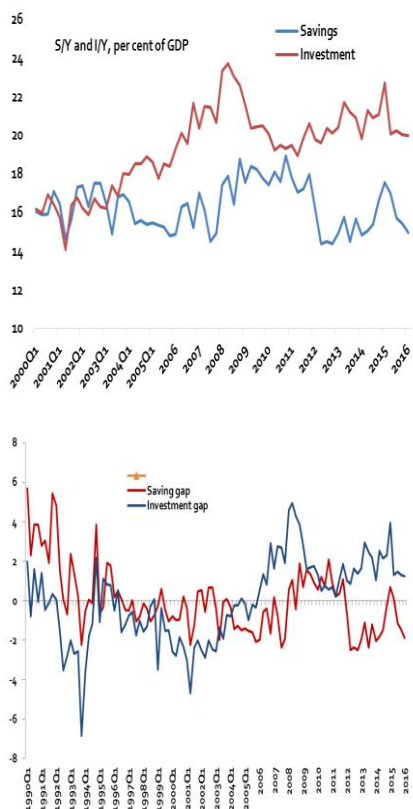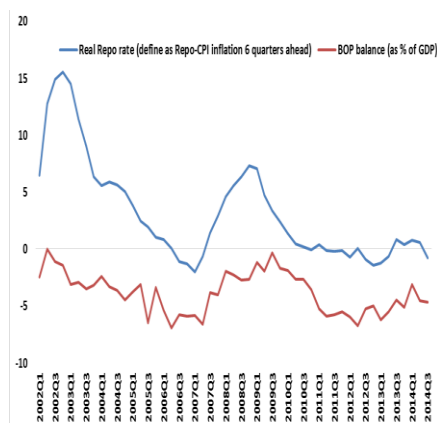**Figure 8: Saving and investment imbalance in South Africa**

Figure 9: Real interest rates and current account

given real policy rate this results in a decline in the size of the pre-existing current account deficit (shown by the arrows below the horizontal axis).

Finally, I show in Figure 7 what happens when global saving dries up, allowing the negative domestic saving to shift the saving schedule to the left. In this case, getting to equilibrium would require a sharp rise in the real policy rate to reflect a new higher neutral rate (at SA_2), offset somewhat by a lower productivity of capital, but generating a collapse in the IS gap (and closure of the current account deficit). The larger the pre-existing IS gap, the larger the economic adjustment needed to close it if global savings turns negative.

Moving away from our charts, a more difficult part of the story involves the local productivity of capital. Current literature suggests that declining advanced economy potential pulls down emerging potential, as global GDP decelerates and via supply chains. But these forces will impact some economies more than others, raising the question of what the effects are for any particular country. More broadly, over the longer term, potential growth in emerging markets might be higher for other reasons, such as demographic change and distance from production possibility frontiers (which should encourage investment).[9]

In a similar way, we shouldn't expect the propensity to save in emerging and developing economies to be very similar to that in advanced economies. In emerging markets (Figure 7), the saving schedule will be more elastic, and should have moved in the opposite direction from global saving (shifting left to show less available saving). South Africa's overall propensity to consume has arguably increased over the past 20 years and fiscal policy has clearly been set to run large deficits. These should lead to a higher interest rate to either induce the required level of saving (say from corporates or households domestically) and/or to attract foreign saving. Reflecting this idea, the consumption preference-based estimate of Hassan & Redford, discussed below, reflects a considerably higher estimate than other methods. Additionally, this gap between investment and saving needs to induce a rise in potential growth, without which it becomes unsustainable, with risk premia rising, pushing up financing costs even as growth slows.

Figure 8 shows saving and investment ratios to GDP and their trajectory since 2000, with the imbalance being the gap between them. The second chart calculates saving and investment ratios as the difference to a long run average saving and investment to GDP. This shows quite clearly that overall investment has remained well above long term averages, while saving swung sharply positive in the immediate wake of the global financial crisis before turning quite negative from 2011. Both suggest a higher NRIR over the medium term. Figure 9 shows a high co-movement between *ex-ante* real interest rates and the deficit on the current account, suggesting that real policy rates have been well below neutral rates.[10]

A fall in potential growth normally pulls down the neutral real rate. However, lower real rates may have little effect on potential growth – the investment response to policy stimulus could be low. This could be for temporary or permanent reasons, or a more fundamental sense of

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[9]   Michael D. Bauer and Glenn D. Rudebusch, Why are long term interest rates so low?, FRBSF Economic Letters, 2016-36, December 5, 2016.
[10]   Figure 9 shows only up to 2014 due to a 6 quarter lag.

uncertainty. Here, lower real rates or large fiscal deficits may offset the initial decline in demand for investment but eventually contribute to more long-term uncertainty, as seen in rising risk premiums. Fiscal policy impacts on the neutral real rate in contradictory ways. More spending on investment, research, and human capital development raises the potential growth rate of the economy and therefore the neutral real rate. With large fiscal deficits since 2008, fiscal policy has pushed up the neutral real rate by using available saving. But since much of the spending has been directed into public wages, this has likely pulled down the neutral real rate somewhat as the contribution to potential growth from such spending is probably not significant.

Estimates of the NRIR

As Hassan and Redford (H&R) show, different estimation methods generate a wide range of NRIR outcomes. The key differences between the outcomes rest on the role of unobserved factors, rather than potential growth. Their Laubach-Williams estimation regresses on potential growth and then other factors captured as 'z.' Potential economic growth, reflected in the 'g' factor in Figure 10, is a relatively stable contributor to the NRIR, declining from about 3.8% in 2000 to 2.0% in 2015. The change in the H&R Laubach-Williams estimate is driven by the 'z' factor, rather than potential growth, and comes out strongly negative.

Alternatively, using an estimation that focuses on time preferences for consumption relative to saving, the results show a quite positive level of NRIR (1.67%). Table 1 shows the various H&R estimates. The moving average and Hodrick-Prescott estimates are based on calculated historical real policy rates.
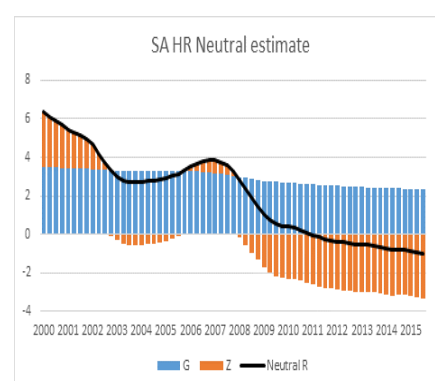
Table 1: Neutral rate estimates (Hassan and Redford)

Moving average	0.77
Hodrick Prescott	0.13
Consumption	1.67
Taylor Rule	-0.31
Laubach-Williams	-1.45

* Estimates are for 2015
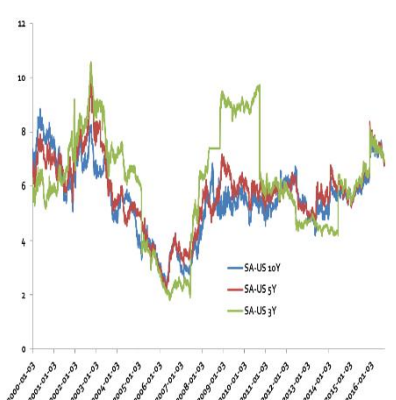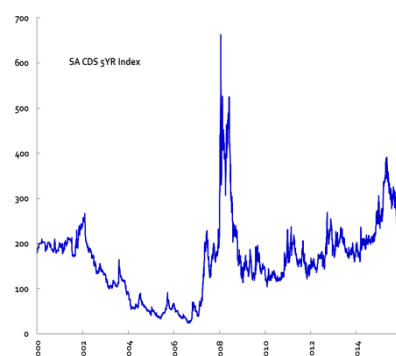
Figure 11: Measures of risk
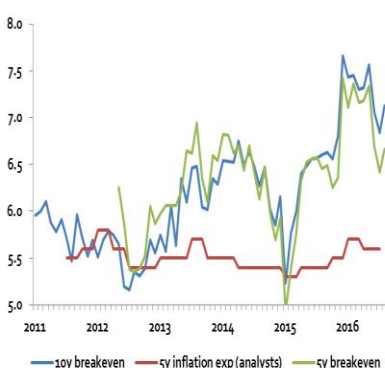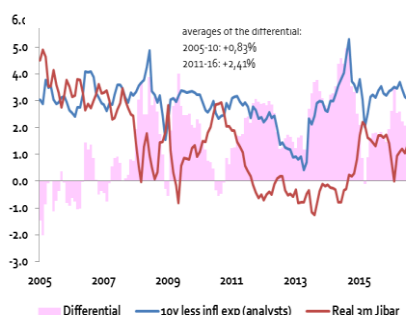

Figure 12: inflation and real risk

Table 2: Ex-ante real interest rates and the neutral rates (Quarterly Projection Model)

		2000-08	**2013**	**2014**	**2015**
Ex-ante real interest rate		3.2	-0.1	0.25	0.5
Neutral rate	Range*	[1.8 – 5.0]	[-0.7 – 2.5]	[-0.5 – 2.7]	[-0.3 – 2.9]
	Central projection	3.4	0.9	1.1	1.3

*based on one standard deviation estimates from the quarterly projection model

To more explicitly account for the impact of external factors, Ruch and Steinbach (R&S) estimate the NRIR using a model that adds global factors explicitly via an uncovered interest rate parity condition (UIP). This relates the differential between real interest rates at home and abroad to expected currency movements.[11]

Domestic real interest rate = Expected change in REER + foreign real interest rate + risk premium

where an increase in the real effective exchange rate (REER) signifies a depreciation. In the long-run equilibrium, this becomes the following specification:

Neutral real rate = expected change in equilibrium REER + foreign neutral real rate + equilibrium risk premium

With a foreign NRIR of 0.5% and a risk premium of 1.5%, a medium term domestic real neutral rate comes out at 2%.

Why does such a risk-based way of looking at the neutral rate matter?

Abstracting away from short-run nominal movements, are there reasons to think that the real equilibrium levels adjust over time or are effected by shorter-term shocks? One hypothesis is that the markets price-in all significant potential shocks and their effects on real risk. The other hypothesis is that they don't and that additional real risks only come to be priced in over time, resulting in a rising neutral real interest rate over the medium term. I abstract away from questions about market distortion.

Figure 11 shows the post-crisis rise in credit insurance costs (USD-based) and the difference between South African and US bond yields, suggesting that risk spreads can vary significantly over time. These are, however, nominal movements reacting to transitory shocks. Figure 12 shows a set of perspectives on the extent to which a real premium (over and above an inflation risk premium) has opened up on South African financial assets. In each instance, the real yield expected by the markets has increased well above the implied inflation differentials, suggesting a rise in a real premium.

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[11]   UIP rarely stands up to sustained empirical scrutiny, however, due to the difficulty of forecasting exchange rate movements resulting from a wide range of factors including political risk, capital controls, taxes, and market complexity and structure. Similarly testing whether UIP holds requires the assumption of rational expectations.

The first chart shows the gap that opened up between the yield on 10 year bonds and 2-year-ahead BER inflation expectations, compared to the real 3 month JIBAR. As the repo rate was lowered, so the real JIBAR fell, but the falling real policy rate increased the inflation premium priced into the 10 year bonds relative to shorter term inflation expectations, as can be seen in the growing differential from 2011. Over the period, 2011 to 2016, this gap widened to average around +2.4%. The gap closed somewhat in 2015 as declining oil prices compressed expectations of future inflation.

The second chart shows a risk premium reflecting time preference, where risk rises that in the long-term inflation is expected to be higher than in the medium run. The gap between 5 and 10 year breakeven inflation rates of about 1.0 percentage points in mid-2014 falls and then rises again to over 1.5 percentage points. Figure 13 shows the real yields on 5-year and 10-year linked bonds compared to the real 3m JIBAR. This shows how the real yield has doubled since 2013.[12]

In summary, the estimates provide useful but incomplete perspectives, raising the question of which to use as a guide to policy. Conceptually, a backward-looking average can provide only so much guidance when short, medium, or long term conditions are changing. Some of those changing conditions involve inflation and inflation risk premiums, but these don't reflect all of the risk in asset prices. Additional real risk is likely to become more important where policy frameworks or institutions are perceived to be unsustainable or have weakened.

Conclusion

Much of the debate about the level of neutral real rate in advanced economies rests on decreasing potential growth and the level of real interest rates in increasing the demand for investment.[13] These coincide with large and negative output gaps. However, in South Africa output gaps are prone to real-time measurement problems and falling potential growth can be hard to explain.

The availability of global saving lowers neutral real rates for the economy, but sustained domestic dissaving suggests that they may be too low or that risks are building for sharp movements in yield curves and exchange rates. This implies that from a modelling and policy perspective, the interplay between domestic and global saving-investment factors and risk seem important and useful. Real risk levels are variable, but also display trends, giving guidance to how they affect neutral real rates. Likewise, for longer term estimates demographics (young population) and distance to production possibility frontiers (technological gaps) should put a floor under potential growth estimates.

Figure 13: Real yields since 2011

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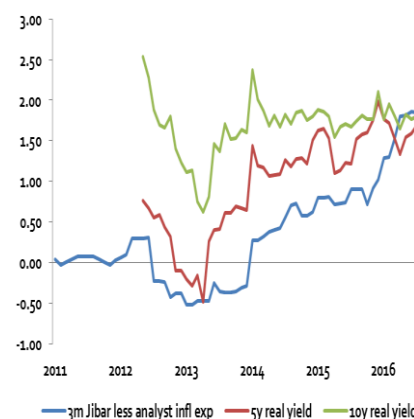
[12] It also shows that this short-term real yield has caught up to the longer-dated linked bonds, suggesting a mismatch in expectations, but also a turning point for either the short or long-term views. The rise in the yield also reflects an over-bought position in rand assets in the run up to 2013.

[13] See Stanley Fischer, "Remarks on the US economy," Aspen Institute, 21 August 2016.
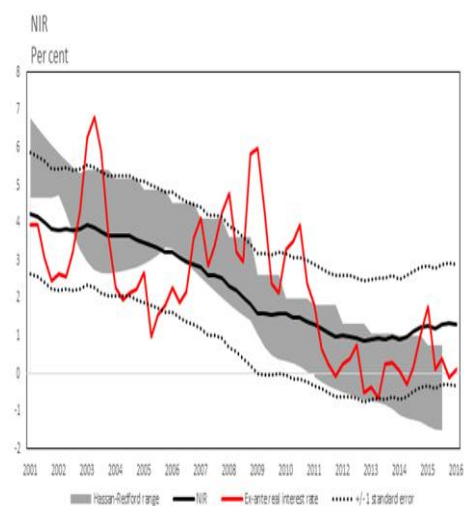
In conclusion, sifting through domestic and external variables and understanding their idiosyncratic drivers remains a critical complement to model-based perspectives on neutral rates. South Africa's neutral rate should have fallen somewhat, alongside lower neutral rates globally. But policy has worked against this through two channels. The sharp fall in real policy rates and aggressive fiscal dissaving dating from 2009/10, all else equal, slowed the movement of the balance of payments toward a more sustainable position by keeping domestic consumption and investment higher and saving lower than they would have otherwise been with a less robust counter-cyclical policy.[14] The impact of policy on potential growth has been weak at best however, and real risk has increased. This suggests that while South Africa's neutral real rate has fallen in the global financial crisis, policy ineffectiveness has increased risk and raised the neutral rate to two per cent.

Table 3: NRIR estimate & Fed hike scenario, (+34 basis points & +36 on risk)

	Estimate	Scenario
Real US Rate	0.41	0.75
SA Risk premium (+)	1.64	2.00
NRIR (= a)	2.05	2.75
Nominal policy rate (+)	7.0	7.0
Expected CPI (-) (2017)	5.9	5.9
Real policy rate (= b)	1.1	1.1
RIR gap (= b-a)	-0.95	-1.65

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[14]   The sensitivity of saving to the interest rate is arguably also lower in South Africa, which would be seen in a steepening of the saving to GDP schedule in the IS framework.