

Revisiting the ability of the yield curve to forecast turning points in the South African business cycle

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WORKING DRAFT – DO NOT QUOTE

1. Introduction

The yield curve reflects rates of return on securities of different maturities – typically short and long-term government bonds (Estrella and Truben, 2006:). In South Africa, the yield curve is generally constructed by comparing the yields offered on 91-day Treasury Bills and 10-year Government Bonds (Nel, 1996, Moolman, 2002, Aziakpono and Khomo, 2007, Clay and Keeton, 2011).

The yield curve's supposed ability to predict turning points in economic activity has a long history in economic theory and the literature. According to Mishkin (2007:136) "the interest rate on a long-term bond will equal an average of the short-term interest rates that people expect to occur over the life of the long-term bond". Because investors require a risk premium to encourage them to purchase long-term securities, long-term interest rates are usually higher than short-term rates and the yield curve is normally positively sloped (Bain and Howells, 2008; Mishkin, 2007).

However, if investors expect short-term rates to decline in the future, the yield curve may be negative. Such a situation may occur when investors believe economic growth is weakening and short-term rates will have to decline.

This relationship explains the expected link between the yield curve and the business cycle. An economy that is growing rapidly may overheat, causing inflation to rise. The monetary authorities will raise short-term interest rates to dampen domestic demand and inflation. High short-term rates therefore result in slower growth. Long-bond investors believe high short-term rates cannot be sustained in an environment of weaker growth. This expectation that short-term rates will fall in the future will be reflected in long-term interest rates being lower than short-term rates. The yield curve has turned negative.

2. Literature review

The theoretical ability of the yield curve to accurately predict changes in the business cycle was well supported in the international literature (cf Estrella and Hardouvelis, 1991, Hu, 1993, Dombrosky and Haubrich, 1996, Estrella and Mishkin, 1996 & 1997, Dueker, 1997, Moneta, 2003, Estrella and Trubin, 2006 and Chinn and Kucko, 2009). However, international evidence suggested that the yield curve's once reliable predictive powers had declined over time. Thus, while Dombrosky and Haubrich (1996) had found the yield curve to be one of the best forecasting tools in the US over the period 1961-95, they found its predictive powers to be very poor over the period 1985-95. Moneta (2003) found the yield curve's predictive powers to be strong in France, Germany, and Italy in the 1970's and 1980's, but to be less so in the 1990's. Chinn and Kucko (2009) found that the yield curve's predictive power had declined over time.

For South Africa, Nel (1996) found that the yield curve is positively related to GDP growth. Moolman (2002 & 2003) and Khomo and Aziakpono (2007) found that the yield spread successfully predicted turning points in the South African business cycle two quarters ahead. However, Khomo and Aziakpono (2007) warned that the yield curve may be also losing its predictive powers in South Africa, as it turned negative in 2002/03, falsely predicted a downswing that never officially happened. Clay and Keeton (2011) found, however, demonstrated that the yield curve did predict the subsequent downturn that started in December 2007, thus implying that the yield spread remained a useful tool to forecast turning points in the South African business cycle. The yield curve, they concluded, had successfully predicted all five economic downswings in South Africa from 1981 to 2009. Only once, in 2002/03, did it signal a downswing that never officially happened.

Explaining the missed prediction in 2002, Botha and Keeton (2014) argued that the false signal by the yield curve of a downturn in 2002 reflected special circumstances at the time. Firstly, domestic economic activity was in fact very weak, even though the South African Reserve Bank did not officially declare a downturn in the business cycle. Secondly, an error by Statistics South Africa in calculating consumer inflation meant short term interest rates remained higher than they should have been. Long-bond rates correctly fell in anticipation of the inevitable cut in short term rates – which occurred as soon as the error in calculating CPI inflation was discovered and rectified.

3. The current downswing

In the most recent downswing that began in December 2013, there have been some interesting observations. Figure 1 illustrates that the downturn in the South African business cycle has been

accompanied by a slight narrowing of the yield gap, but the yield curve has remained positive. Whereas in Botha and Keeton (2014) the emphasis was on an inverted yield curve, signalling a downswing that never occurred, in the most recent downswing the evidence suggests that a downswing occurred but this was not predicted by the yield curve which remained positive.

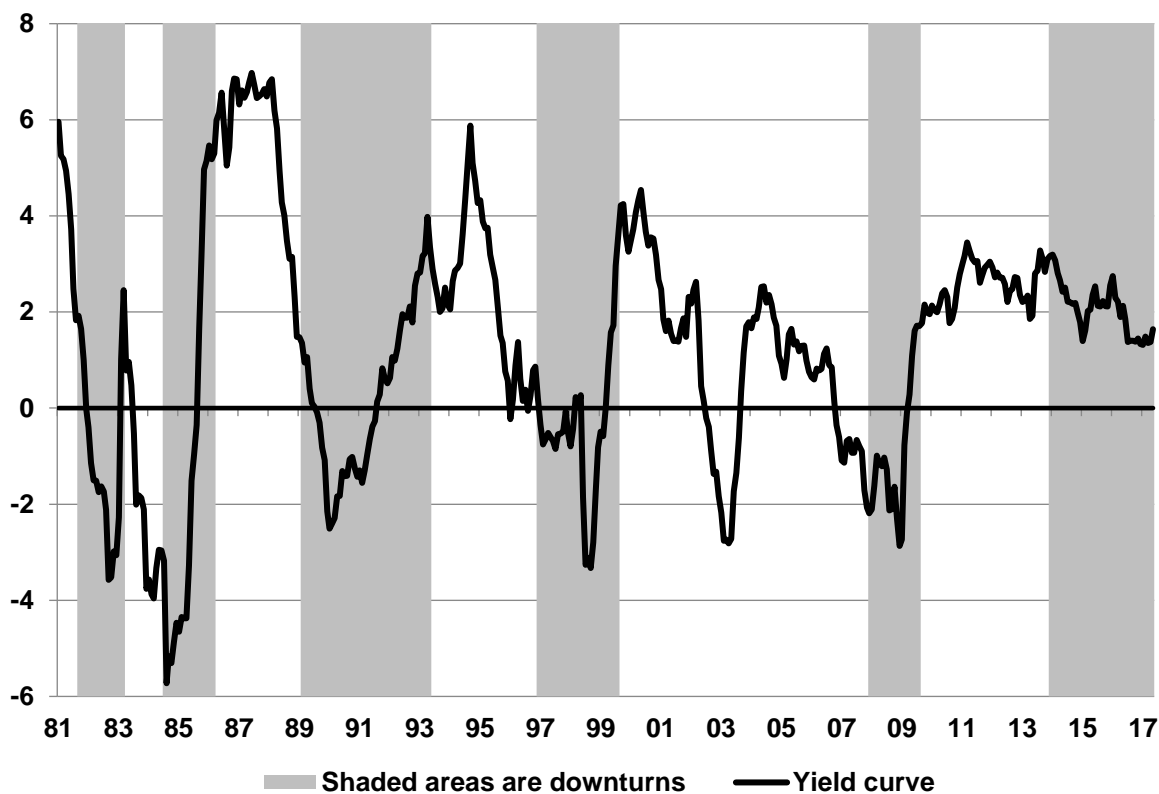


Figure 1: South Africa – The yield curve and changes in the business cycle

Figure 2 illustrates that, in line with economic theory, the turning negative of the yield curve in previous economic downswings was caused by both short-term and long-term interest rates rising. Short-term rates rose more than long-term rates, turning the yield gap negative. Economic upswings were preceded by falling short- and long-term rates, with short-term rates falling much faster, turning the yield gap negative.

Both short- and long-term rates started to rise ahead of the downturn that started in December 2013. However, the rise in each was modest and insufficient to turn the yield gap negative.

Based on a probit model that regressed the probability of a downswing on a constant and lagged yield curve, the best-fitting model was found to predict a downswing four months ahead (compared with 2 months ahead for Khomo and Aziakpono, 2007 and Clay and Keeton, 2011). Figure 3 shows that the

yield curve indeed failed to signal the most recent downturn in the South African business cycle. The predicted likelihood of a downturn was only around 30% in the months leading up to the official downswing that began in December 2013.

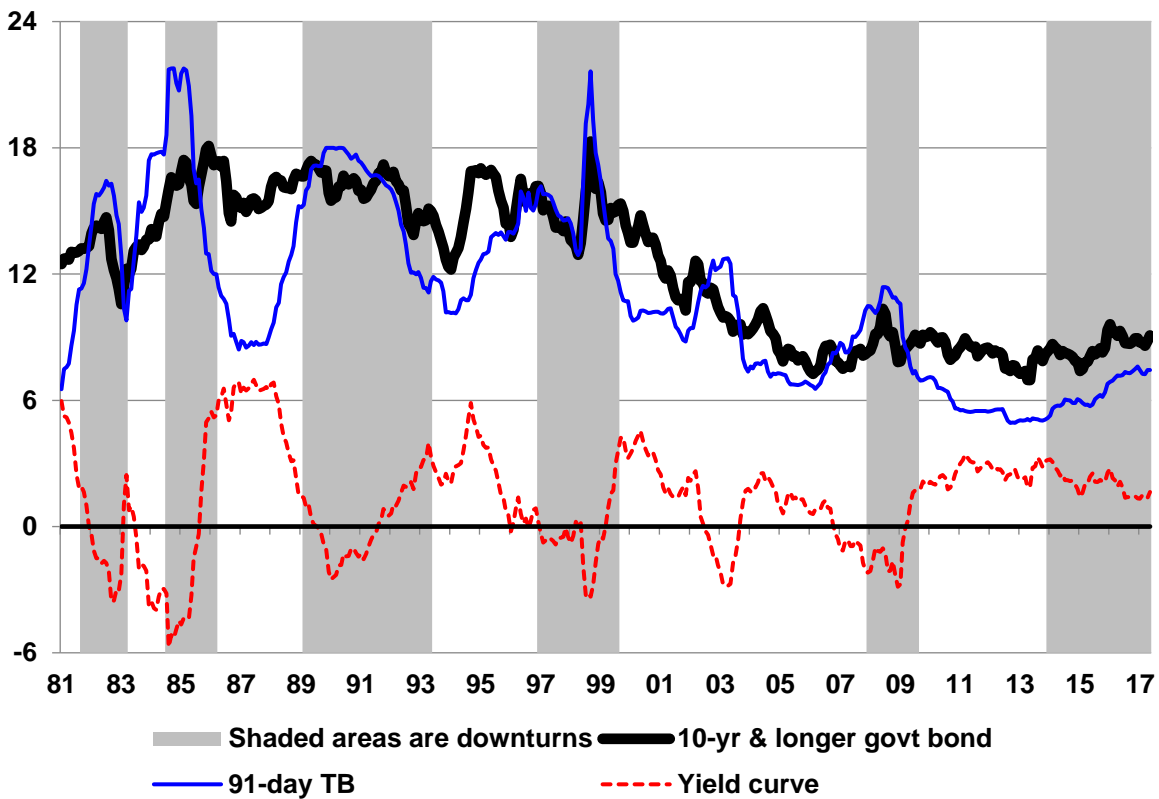


Figure 2: South Africa - short-term and long-term interest rates and the yield gap.

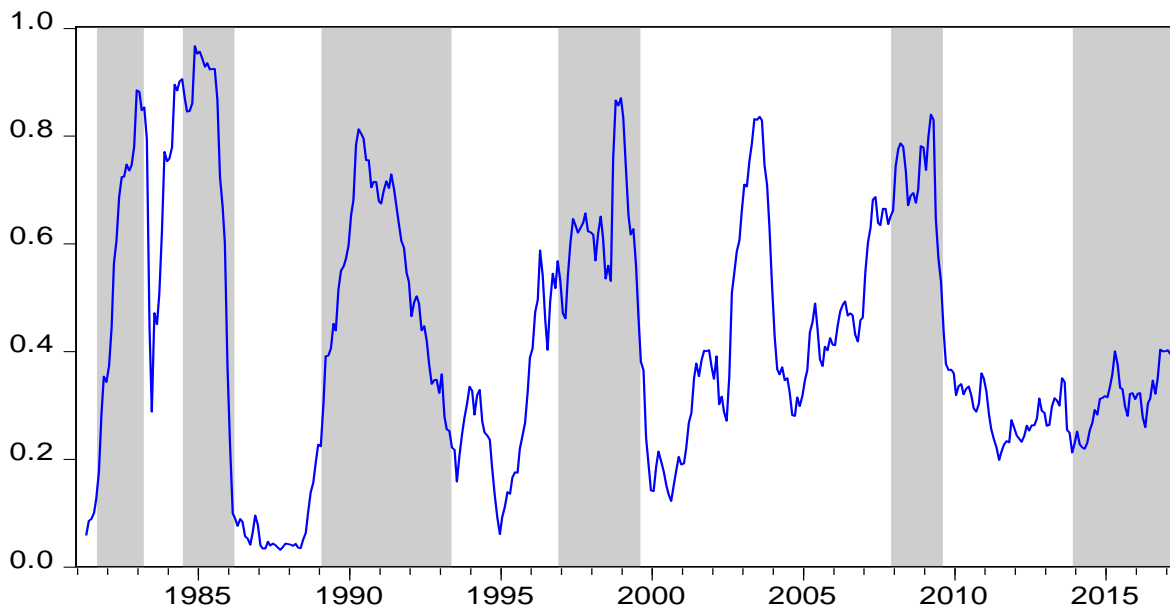


Figure 3: Probability of a downswing four months ahead

4. Possible explanations for why the yield curve did not predict the recent downturn

This paper explores two possible explanations of why the yield curve failed to predict the most recent prolonged downturn in the business cycle.

4.1 Were short—term rates too low?

One possible explanation is that short-term rates may not have risen by as much as they should have. A faster rise in short-term interest rates might have turned the yield gap negative. It would, however, have worsened the downturn.

One instrument often used to determine the degree of change in the short-term interest rate required to meet the inflation target, as part of the monetary transmission mechanism, is the Taylor Rule (1993: 202) as set out in equation 1.

$$\text{Interest Rate} = \text{Price Inflation} + \text{Equilibrium Real Rate} + \alpha_1 (\text{Price Inflation} - \text{Inflation Target Level}) + \alpha_2 (\text{Output Gap}). \quad (1)$$

Several authors including Dennis (2000: 1) have, however, argued that in a small open country context, the exchange rate should be included. This is done in equation 2.

$$\text{Interest Rate} = \text{Price Inflation} + \text{Equilibrium Real Rate} + \alpha_1 (\text{Price Inflation} - \text{Inflation Target Level}) + \alpha_2 (\text{Output Gap}) - \alpha_3 (\text{Exchange Rate}) + \alpha_4 (\text{Exchange Rate in Previous Period}) \quad (2)$$

Empirical results from Taylor Rule studies on South African data have been somewhat mixed, but significant. Aron and Muellbauer (2000) concluded that the Taylor rule did not explain South African monetary policy particularly well, but their study spanned three different monetary policy regimes and the data went up to 1997, which was before the formal introduction of inflation targeting in 2000. Ferreira (2005) and Mdingi (2016) both found that the close association between the Taylor rule predictions of the Prime Overdraft Rate and the actual rate supports the indicator value of the Rule within the context of South African monetary policy. Other papers include Bruggemans (2005).

The Prime Overdraft Rate as predicted by the Taylor Rule model (open economy version) and its actual levels are shown in Figure 4.

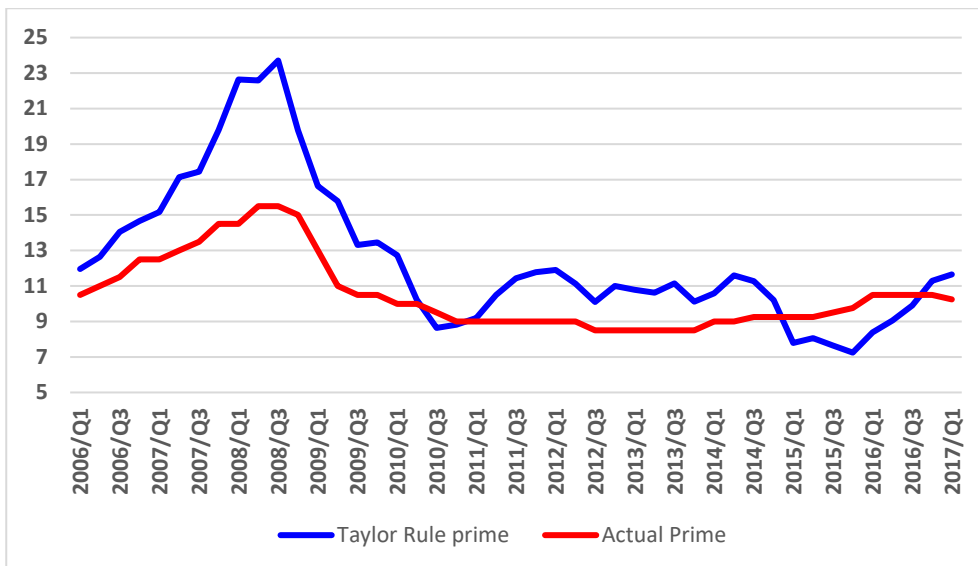


Figure 4: Taylor Rule Prime and Existing Prime Rate in South Africa, 2006Q1-2017Q1

Source: Updated from Mdingi (2016).

The way the graphs trend together and their convergence suggest the Taylor Rule has value in explaining monetary policy in an inflation targeting framework. The Taylor Rule Prime indicates that monetary policy should have been more restrictive since the start of 2016 as inflation then breached the upper band of the target and stayed there for most of the year. At the same time, unfortunately, economic growth slowed down into negative territory, suggesting that the SARB had to be cautious in the extent to which it was prepared to raise short-term rates.

Had short-term rates been raised in line with the Taylor Rule and long-term rates had been unchanged, the yield gap may well have turned negative.

But there are 2 important qualifications to this finding. Firstly, the yield gap would have turned negative only in late-2016. The downturn officially started in December 2013. Thus, the negative yield curve would not have predicted the downturn, it would have lagged it. Secondly, the Taylor Rule suggests interest rates should have been higher than was the case because of the weakness of the rand exchange rate and the resultant rise in the inflation gap. The output gap is negative for much of the recent period. Thus, the yield gap may have turned negative, but not in the way theory suggests. The theory of the yield curve suggests that short-term rates rise sharply to cool down an overheated inflation in which inflation is rising. SA inflation in the recent period rose not because the economy was overheated, but because the exchange rate weakened sharply. The yield curve would therefore not have been expected to turn negative in such circumstances. It was also appropriate that the

Monetary Policy Committee did not raise interest rates as much as the yield curve suggested, because inflation was not above the target band because of excessive demand.

4.2 The slowdown was caused by supply-side shocks

A second explanation for the failure of the yield gap to turn negative is that the nature of the downturn that started in December 2013 is different from previous downswings. Previous downswings were preceded by periods in which the economy overheated and inflation rose. Long-bond rates increased in response to rising inflation and in anticipation of higher short-term rates. Short-term rates then rose to combat inflation. In the process domestic demand weakened, causing the economic cycle to go into a downswing and long-term rates fell below short-term interest in anticipation that short-term rates would decline.

The latest downswing was accompanied by modest increases in inflation, but these were caused by the weakening of the exchange rate and not economic overheating. Short-term rates were raised modestly to counter the second-round inflationary consequences of the weaker exchange rate. The downswing in economic activity was caused not by higher interest rates but by supply side shocks – namely, sharp falls in commodity prices, drought and a decline in investor and consumer confidence caused by increased domestic political uncertainties.

That the yield curve did not predict a downturn caused by supply-side factors is unsurprising: There is nothing in theory or the literature to suggest it would do so.

5. Should the yield curve be discarded as a forecasting tool?

Should the yield curve therefore be discarded as a predictive tool in SA? The relationship between GDP growth and the yield curve was the focus of Nel's (1996) initial article on the yield curve in South Africa. Figure 5 shows the GDP growth forecasts as predicted by the yield spread lagged one quarter. In general, the result show that the yield spread predicted GDP growth relatively well over the sample period. This implies that, although having become less reliable as a forecasting tool for business cycle turning points, the yield curve can still be a useful predictor of the short-run economic growth path.

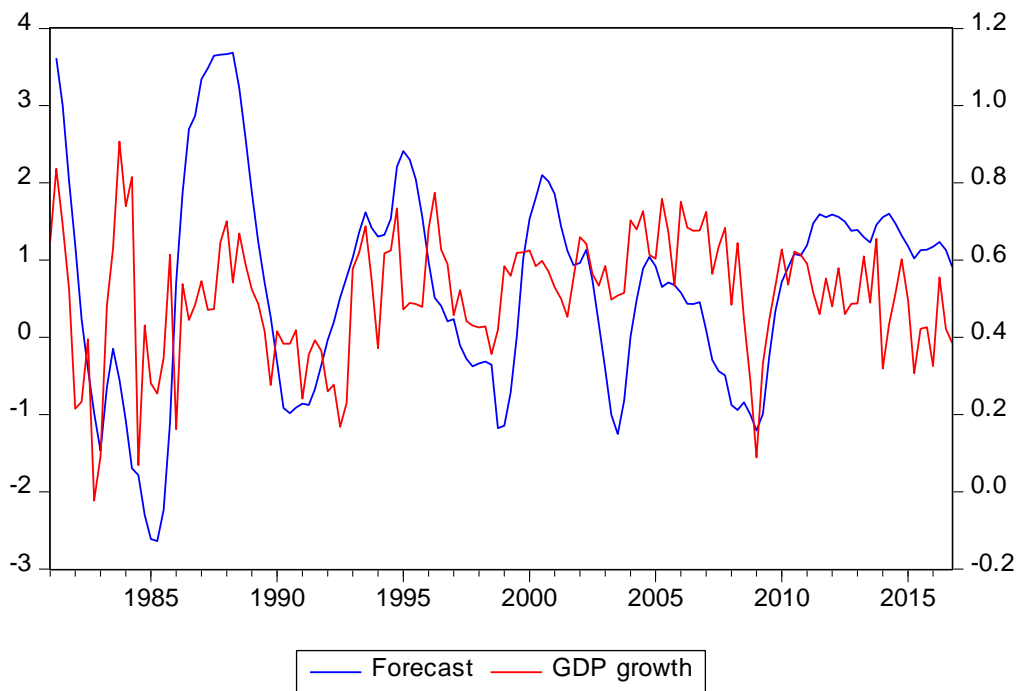


Figure 5: Forecasted and actual GDP growth

6. Conclusion

The yield curve, which had correctly predicted all five of South Africa's economic downswings from 1981-2008 failed to predict the downswing which began in December 2013. This is because the downswing was the result of negative supply-side shocks. The economy did not undergo a traditional boom-bust cycle in which the economy first overheats and then cools down because of rising short-term interest rates. It is therefore unsurprising that the yield curve remained positive even as the economic downturn began.

It can be concluded that the yield curve cannot predict downturns caused by supply side shocks. This is not surprising as there is nothing in theory to suggest it should do so. It will not be possible to judge whether the yield curve is still useful in predicting downturns preceded by excessive demand and rising short-term rates until such a "traditional" business cycle is again experienced. However, the yield curve remains useful as a predictor of changes in GDP growth as opposed to turning points in the business cycle. As such, the yield curve could still be important in forecasting the economic growth path, even if its ability to predict business cycle turning points has become less reliable.

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