Box 4 Explaining bond yield and bond price statistics[1]

Yields and price indices[2] are important indicators of developments in the bond market. The direction and magnitude of changes in the yield on bonds of different maturities[3] reflect market participants' responses to, among other factors, global developments and expectations about domestic inflation, the exchange value of the rand, the fiscal position, credit ratings and the repurchase rate. The effect of which is transmitted throughout the maturity spectrum, as reflected by changes in the shape of the yield curve.[4] This box discusses the sources and methodology applied in the calculation of bond yields and price indices published in the *Quarterly Bulletin*, and highlights how these statistics form part of the analysis in the *Quarterly Economic Review.*

The daily data of all listed bonds traded, which are used to compile both the nominal and real yield statistics for the different maturity ranges for government bonds[5] and for Eskom bonds, are sourced from the JSE Limited (JSE). The monthly average yield of the different maturity ranges is calculated from the daily average yield[6] of each listed bond.[7] The maturity categories reflect the remaining time to maturity and therefore, as time progresses, the respective bonds migrate across the different groupings with the selections per group adjusted and the time series linked.

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1 This box relates to the statistics on yields and price indices on bonds traded on the JSE Limited on page S–31 in this edition of the *Quarterly Bulletin* and the discussion in the *Quarterly Economic Review* in the Interest rates and yields section.

2 Bonds are interest bearing debt instruments which, among others, could be compared in terms of price or yield-to-maturity. The price reflects the present value of the bonds' future cash flow, which consists of coupon interest cash flows and the repayment of the principal amount. The yield-to-maturity is the discount rate that equates the present value of the bonds' future cash flow to its current price.

3 The maturity date of a bond is the specific future date on which the issuer has to repay the principal amount borrowed to the bondholder.

4 The yield curve, or term structure of interest rates, is a snapshot as at a specific point in time of the relationship between the yield and remaining, or unexpired maturity of a series of different bonds.

5 For more detail on the domestic marketable bonds of national government, see page S–58 in this edition of the *Quarterly Bulletin*.

6 The daily average yield is calculated as the sum of the yields of all trades divided by the number of trades.

7 The monthly average yield of a maturity category is the average of the daily average yields of the bond in the category.

Constituent bond codes of the monthly average yields

Government bonds					Eskom bonds
Nominal yields				Real yield	
0 to 3 years	3 to 5 years	5 to 10 years	10 years and over	10 years and over	
R2023	R186	R2030	R2032	R202	ES33

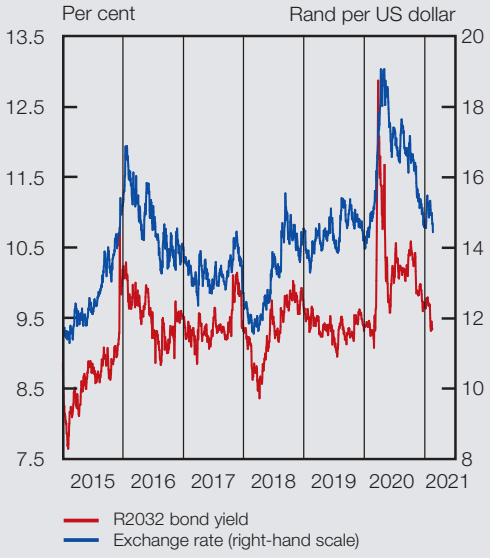
Source: SARB

The price index statistics of bonds facilitate the measurement of the performance of the bonds traded on the JSE and include time series of the All Bond, Government Bond and Other Bond Indices from the FTSE/JSE Fixed Income Series.[8]

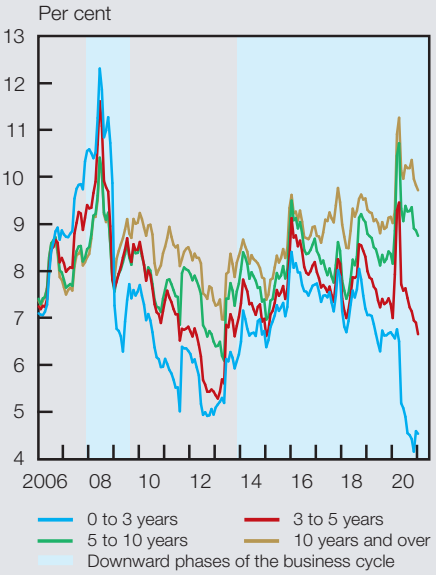
The yield curve discussed in the *Interest rates and yields* section of the *Quarterly Economic Review* represents the nominal bond curve, with the data sourced from IRESS as compiled by the JSE and based on the JSE's methodology.[9] The JSE's suite of yield curves also includes a nominal swap curve and a real bond curve for inflation-linked bonds. The nominal bond curve renders the nominal zero-coupon yields[10] at which government obtains funding and is based on Treasury bills (TBs)[11] and government bonds.[12]

The statistics of the daily or monthly average yield of a specific South African rand-denominated bond, or for a specific maturity range over time, facilitate time series analysis of movements in bond yields and their co-movement with other variables, such as the exchange value of the rand. Bond yields can also be analysed over time in relation to the upward and downward phases of the business cycle.[13] The break-even inflation rate, which represents a measure of expected inflation, can be derived from the difference between the nominal and real yields of government bonds of similar maturity. The yield gap, which is measured as the difference between yields at the extreme long and short end of the yield curve, can be derived from the yield curve statistics and is an indicator of changes in the shape of the yield curve over time.

Nominal government bond yield and the exchange rate



Nominal government bond yields of different maturity ranges and the business cycle



Sources: IRESS, JSE and SARB

The yield gap is a point in time analyses which shows progression, from an extremely inverted or negatively sloping curve, where yields at the short end exceeded those at the long end by 520 basis points on 18 December 2008, at the time of the global financial crisis, to a steeply upward sloping positive curve on 2 November 2020 during the coronavirus disease 2019 (COVID-19) pandemic, when yields at the long end exceeded that at the short end by 834 basis points.

8 For the ground rules of the FTSE/JSE Fixed Income Index Series, see https://www.jse.co.za/services/indices/ftsejse-fixed-income-index-series

9 For the detail methodology, see 'The JSE Zero-Coupon Yield Curves. Methodology Document', September 2012 http://docplayer.net/32913027-The-jse-zero-coupon-yield-curves-methodology-document.html

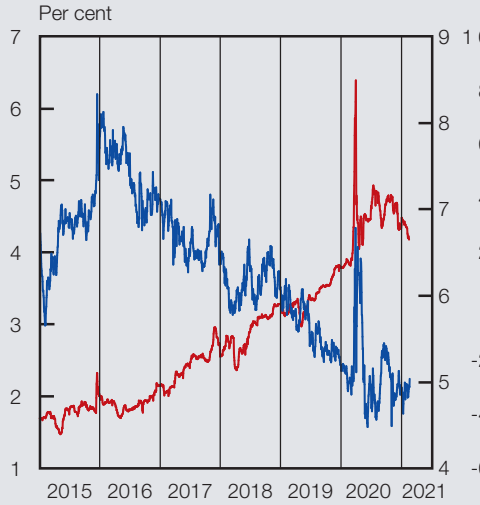
10 The difference in zero-coupon rates reflects differences in the term to maturity.

11 There are 91-, 182-, 273- and 365-day TBs.

12 These are the constituents of the GOVI index, that is, the 10 most liquid South African government bonds over time.

13 See page S–161 in this edition of the *Quarterly Bulletin* for the business cycle phases of South Africa since 1945.

Real government inflation-linked bond yield and the break-even inflation rate

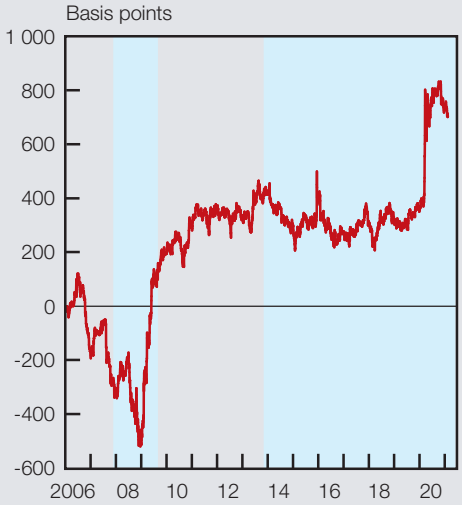


Real yield: 10 years and over
Break-even inflation rate in the 7–9 year maturity range* (right-hand scale)

* Difference between the nominal yield on the R2030 bond and the real yield on the R210 inflation-linked bond

Sources: IRESS, JSE and SARB

Yield gap and the business cycle

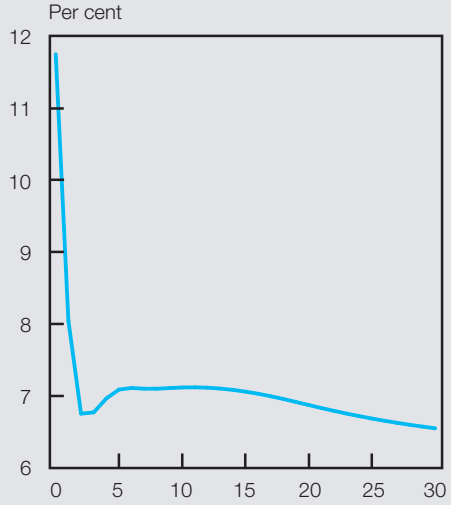


Yield gap*
Downward phases of the business cycle

* Difference between yields at the extreme long and short end of the yield curve

The yield curve can also be flat when short- and long-term yields are the same, or humped, when yields at a specific maturity interval are higher than the others. Over the long term, yield curves tend to be positively sloped, which reflects liquidity and marketability preferences over the maturity spectrum.

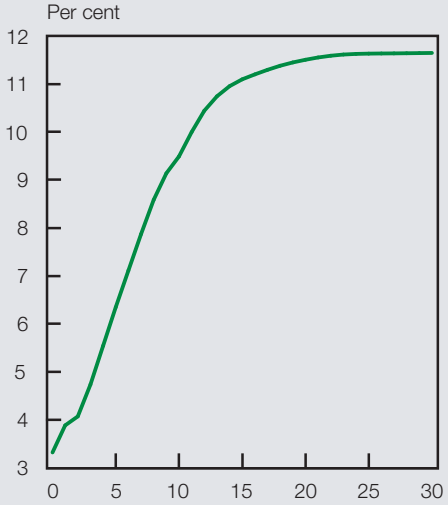
Inverted yield curve



18 December 2008

Sources: IRESS and JSE

Upward sloping yield curve



2 November 2020

The interest rate and bond yield statistics are also used to derive the interest rate spread[14] or yield gap, which is one of the component time series of the South African Reserve Bank's (SARB) composite leading business cycle indicator. For a more detailed analysis of the impact of COVID-19 on the interest rate spread and the composite leading business cycle indicator, see '*Box 1: Did the national lockdown distort the composite leading business cycle indicator?*' in the December 2020 edition of the *Quarterly Bulletin.*[15]

14 The interest rate spread is the difference between the yield on 10-year South African rand-denominated government bonds traded in the domestic bond market and the tender rate on 91-day TBs.

15 https://www.resbank.co.za/en/home/publications/publication-detail-pages/boxes/2020/December2020Didthenationallockdowndistortthecompositeleadingbusinesscycleindicator