UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Financial Economics

Session 6: Shares and Bonds

A concise overview of Bonds

Postgraduate Class

Economics Department Stellenbosch

Lecturer : Nico Katzke

Nicokatzke@sun.ac.za

Department of Economics

DEPARTMENT OF ECONOMICS

3 October 2025: Sovereign Yields

Fixed Income: Daily closing levels

Nominals Bonds

Ticker	Maturity	Next coupon	Coupon	MTM yield	1D change	All-in Price	Clean Price	Accrued interest	Modified Duration	Delta	RPBP	Convexity	Return (1D)	Return (1M)	Return (3M)	Return (YTD)	Return (1YR)
R186	21 Dec 2026	22 Dec 2025	10.50	**7.440**	**0.020**	106.541	103.434	3.107	1.09	-1.16	116.38	1.77	0.00%	0.81%	2.27%	7.21%	8.96%
R2030	31 Jan 2030	02 Feb 2026	8.00	**7.885**	**0.010**	101.874	100.384	1.490	3.54	-3.61	360.99	15.59	-0.01%	1.65%	3.87%	11.15%	13.63%
R213	28 Feb 2031	02 Mar 2026	7.00	**8.185**	**0.005**	95.616	94.906	0.710	4.35	-4.16	416.04	23.23	0.00%	2.04%	4.56%	12.80%	15.42%
R2032	31 Mar 2032	31 Mar 2026	8.25	**8.510**	**0.015**	98.881	98.722	0.158	4.92	-4.86	486.50	30.28	-0.05%	2.40%	4.94%	13.38%	16.20%
R2033	31 Mar 2033	31 Mar 2026	10.00	**8.705**	**0.025**	107.200	107.009	0.192	5.28	-5.66	565.69	35.98	-0.11%	2.53%	5.28%	14.28%	17.16%
R2035	28 Feb 2035	02 Mar 2026	8.88	**9.170**	**0.015**	99.059	98.160	0.900	6.19	-6.14	613.59	51.06	-0.07%	3.67%	6.57%	15.26%	18.16%
R209	31 Mar 2036	31 Mar 2026	6.25	**9.400**	**0.015**	79.403	79.283	0.120	7.12	-5.65	565.36	65.98	-0.08%	4.34%	7.40%	16.55%	18.76%
R2037	31 Jan 2037	02 Feb 2026	8.50	**9.665**	**0.000**	93.636	92.053	1.584	6.86	-6.42	642.16	65.26	0.03%	4.22%	7.43%	16.14%	18.47%
R2038	31 Mar 2038	31 Mar 2026	10.88	**9.725**	**0.005**	108.415	108.206	0.209	6.97	-7.55	755.39	69.35	-0.01%	4.29%	7.24%	16.22%	19.60%
R2040	31 Jan 2040	02 Feb 2026	9.00	**10.090**	**-0.020**	93.474	91.797	1.677	7.53	-7.04	704.23	84.10	0.18%	4.62%	8.01%	15.85%	18.11%
R214	28 Feb 2041	02 Mar 2026	6.50	**10.070**	**0.005**	73.009	72.351	0.659	8.42	-6.14	614.40	102.99	-0.01%	4.99%	8.38%	15.79%	17.26%
R2044	31 Jan 2044	02 Feb 2026	8.75	**10.265**	**-0.040**	89.192	87.562	1.630	8.29	-7.39	739.00	108.79	0.36%	5.95%	9.32%	16.18%	18.11%
R2048	28 Feb 2048	02 Mar 2026	8.75	**10.245**	**-0.030**	87.841	86.954	0.887	8.86	-7.78	778.05	130.58	0.29%	6.39%	9.77%	16.42%	17.64%
R2053	31 Mar 2053	31 Mar 2026	11.63	**10.125**	**-0.020**	114.052	113.829	0.223	9.06	-10.33	1 033.22	142.93	0.21%	6.44%	9.95%	17.67%	19.16%

This week: Bonds!

- Several other sources (the textbooks prescribed for the course, e.g.) have been used to set up these slides, although no single source covers all that which is discussed in this session.
- For exam purposes, these notes should suffice.

Political Impact

- "Regardless of who wins in November – fiscal spending will likely increase, which will cause a steepening of the yield curve."
- - BlackRock Asset Managers

Why were DM Central Banks reluctant to raise rates from 2015 - 2022?

- Fragile markets – markets experienced high volatility during mid 2016, which made the Fed reluctant to add to the volatility by raising rates (see the CBOE VIX rate).
- Dollar strength, combined with the Chinese's devaluation in 2016, implied the Fed remained reluctant to add pressure on the value of the dollar.
- Inflation in the US have not been giving the Fed pressure to raise rates.
- In 2018, reluctance could again be attributed to trade war pressures, weak EM and strong Dollar conditions – all of which stands to gain from a more dovish Fed.
- In 2019, this story continued with added Chinese trade war pressures and market weariness as a result.
- 2020 – 2021 well, who dares rock the boat with Covid induced economic contractions?

2022 – Inflation Chickens Home to Roost

- With inflation in developed regions reaching historic highs, CB's in developed regions have been forced to act using QT.
  - This past week alone (19-23 September) all of BoE, Sweden, Norway, Switzerland and the US raised rates in order to clamp down on inflationary pressures.
- All accept for the BoJ – which has seen the Yen fall precipitously this year.
  - BoJ has reiterated again its position not to raise rates and maintain its ultra accommodative monetary stance.
  - BoJ this week intervened in currency markets to strengthen its currency (by effectively dumping dollar reserves) – intervening in currency markets for the first time in > 20 years.
  - Why?

FOMC meetings for the FEDs (2016)

Calendar 2016

	Announcement Date	Time	Rate (%)	For	Against	Policy Concern
1)	January 27	21:00	0.25 - 0.5	10	0	Growth
2)	March 16	20:00	0.25 - 0.5	9	1	Growth
3)	April 27	20:00	0.25 - 0.5	9	1	Growth
4)	June 15	20:00	0.25 - 0.5	10	0	Growth
5)	July 27	20:00	0.25 - 0.5	9	1	Growth
6)	September 21	20:00	--	--	--	--
7)	November 2	20:00	--	--	--	--
8)	December 14	21:00	--	--	--	--

…get this by typing FOMC <GO> on Bloomberg…

How are the markets pricing in a rate hike? → Implied Forward Yield on the 3MTbill below:
Analyst predictions? → Median Forecast (between 0.95 and 2.35 for Q4 '17)

95) Chart Analysts | 96) Forecast Histogram | Bond Yield Forecasts: Analysts

United States
US 3-Month Libor

Market Yield 0.85

Recent Updates
M. Schomer
L. Alexander
J. Lavorgna
T. Costerg

	Q3 16	Q4 16	Q1 17	Q2 17	Q3 17	Q4 17
Bloomberg Wgt Avg	0.71	0.87	0.98	1.12	1.25	1.44
Implied Forward Yield	1.57	1.56	1.56	1.57	1.55	1.52
Median Forecast	0.80	0.89	1.00	1.13	1.20	1.39
Average Forecast	0.79	0.89	0.99	1.13	1.26	1.45
High Forecast	1.00	1.10	1.35	1.60	1.85	2.35
Low Forecast	0.38	0.38	0.68	0.68	0.86	0.95
Responses	34	34	34	33	32	30
Sep. Survey Median	0.80	0.89	1.00	1.13	1.20	1.40
Aug. Survey Median	0.75	0.85	0.91	1.08	1.18	1.38
Change in Medians	0.06	0.04	0.09	0.05	0.02	0.02

…get this by typing BYFC <GO> on Bloomberg…

FOMC meetings for the FEDs (2020)

FOMC Activities

Calendar 2020

	Announcement Date	Time	Rate (%)	For	Against	Policy Concern
1)	January 29	21:00	1.50 - 1.75	10	0	--
2)	March 3	17:00	1.00 - 1.25	10	0	--
3)	March 15	23:00	0.25	9	1	--
4)	April 29	20:00	0.25	10	0	--
5)	June 10	20:00	0.25	10	0	--
6)	July 29	20:00	0.25	10	0	--
7)	September 16	20:00	0.25	8	2	--
8)	November 5	21:00	--	--	--	--

…get this by typing FOMC <GO> on Bloomberg…

	Rate	Market Yld	Q3 20	Q4 20	Q1 21	Q2 21	Q3 21	Q4 21	Q1 22	Q2 22	Q3 22	Q4 22
	United States											
1)	US 30-Year	1.42	1.45	1.51	1.61	1.71	1.79	1.91	2.01	2.09	2.18	2.24
2)	US 10-Year	0.66	0.69	0.76	0.88	0.97	1.05	1.16	1.25	1.35	1.45	1.53
3)	US 5-Year	0.27	0.32	0.39	0.47	0.54	0.62	0.70	0.84	0.92	1.02	1.08
4)	US 2-Year	0.13	0.17	0.21	0.28	0.33	0.38	0.43	0.53	0.59	0.67	0.74
5)	US 3-Month Libor	0.22	0.29	0.31	0.34	0.36	0.37	0.42	0.47	0.52	0.56	0.60
6)	Fed Funds Rate - Upper Bound	0.25	0.25	0.25	0.25	0.25	0.25	0.30	0.30	0.35	0.40	0.40
7)	Fed Funds Rate - Lower Bound	0.00	0.00	0.00	0.01	0.01	0.02	0.05	0.07	0.11	0.14	0.17
	3 Month - 10 Year Spread	0.44	0.40	0.45	0.53	0.61	0.67	0.74	0.78	0.83	0.89	0.93
	Germany											
8)	Germany 10-Year	-0.53	-0.49	-0.40	-0.32	-0.26	-0.19	-0.17	-0.18	-0.07	0.02	-0.03
9)	Germany 2-Year	-0.71	-0.62	-0.63	-0.61	-0.58	-0.57	-0.53	-0.57	-0.54	-0.50	-0.47
10)	3-Month Euribor	-0.50	-0.46	-0.46	-0.43	-0.42	-0.42	-0.41	-0.39	-0.39	-0.38	-0.36
11)	ECB Main Refinancing Rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12)	ECB Deposit Rate	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.50	-0.49	-0.49	-0.46	-0.45
	3 Month - 10 Year Spread	-0.03	-0.03	0.06	0.12	0.16	0.23	0.24	0.21	0.32	0.40	0.33
	United Kingdom											
13)	UK 10-Year	0.20	0.17	0.25	0.29	0.37	0.42	0.57	0.37	0.46	0.54	0.71
14)	UK 2-Year	-0.06	-0.08	-0.02	0.02	0.07	0.14	0.18	0.08	0.13	0.15	0.16
15)	UK 3-Month Libor	0.06	0.14	0.12	0.14	0.16	0.16	0.15	0.19	0.28	0.33	0.38
16)	BOE Bank Rate	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.15	0.20	0.25	0.25
	3 Month - 10 Year Spread	0.14	0.04	0.13	0.15	0.20	0.26	0.42	0.18	0.18	0.21	0.32

…get this by typing BYFC <GO> on Bloomberg…

FOMC meetings for the FEDs (2022)

Calendar 2022

	Announcement Date	Time	Rate (%)	For	Against	Policy Concern
1)	January 26	21:00	0.00 - 0.25	9	0	--
2)	March 16	20:00	0.25 - 0.50	8	1	--
3)	May 4	20:00	0.75 - 1.00	9	0	--
4)	June 15	20:00	1.50 - 1.75	10	1	--
5)	July 27	20:00	2.25 - 2.50	12	0	--
6)	September 21	20:00	3.00 - 3.25	12	0	--
7)	November 2	20:00	--	--	--	--
8)	December 14	21:00	--	--	--	--

…get this by typing FOMC <GO> on Bloomberg…

Region G7 Spread 2 Year - 10 Year

	Rate	Mkt Yld	Q3 22	Q4 22	Q1 23	Q2 23	Q3 23	Q4 23	Q1 24	Q2 24	Q3 24	Q4 24
	United States											
1)	US 30-Year	3.61	3.36	3.36	3.35	3.32	3.29	3.25	3.28	3.24	3.27	3.29
2)	US 10-Year	3.69	3.22	3.17	3.19	3.18	3.09	3.02	3.06	3.02	3.03	3.03
3)	US 5-Year	3.92	3.35	3.36	3.31	3.24	3.10	2.99	3.04	2.99	2.98	2.98
4)	US 2-Year	4.12	3.47	3.51	3.52	3.42	3.20	3.07	2.98	2.91	2.83	2.80
5)	US 3-Month Term SOFR	3.54	3.04	3.55	3.67	3.62	3.33	3.18	3.02	2.88	2.76	2.63
6)	Fed Funds Rate - Upper Bound	3.25	3.25	4.10	4.15	4.10	3.95	3.85	3.70	3.55	3.50	3.25
7)	Fed Funds Rate - Lower Bound	3.00	3.00	3.83	3.91	3.85	3.71	3.61	3.44	3.29	3.26	2.99
	2 Year - 10 Year Spread	-0.43	-0.25	-0.33	-0.33	-0.24	-0.10	-0.05	0.08	0.11	0.19	0.23
	Germany											
8)	Germany 10-Year	1.93	1.64	1.67	1.69	1.62	1.58	1.57	1.66	1.58	1.69	1.77
9)	Germany 2-Year	1.80	1.32	1.49	1.57	1.43	1.39	1.31	1.46	1.35	1.39	1.46
10)	3-Month Euribor	1.12	0.96	1.92	2.12	2.11	2.07	1.97	1.87	1.77	1.76	1.73
11)	ECB Main Refinancing Rate	1.25		2.30	2.55	2.55	2.50	2.45	2.30	2.30	2.30	2.25
12)	ECB Deposit Rate	0.75		1.81	2.04	2.03	2.01	1.97	1.85	1.85	1.83	1.77
	2 Year - 10 Year Spread	0.13	0.32	0.18	0.11	0.19	0.20	0.25	0.20	0.23	0.30	0.31
	United Kingdom											
13)	UK 10-Year	3.49	2.74	2.73	2.72	2.51	2.41	2.30	2.30	2.31	2.37	2.43
14)	UK 2-Year	3.52	2.70	2.71	2.53	2.22	2.08	1.95	1.55	1.53	1.60	1.68
15)	UK 3-month Sonia	2.64	2.25	2.57	2.62	2.37	2.31	2.31	2.30	2.23	2.27	2.11
16)	BOE Bank Rate	2.25	2.25	2.90	3.05	3.05	2.95	2.80	2.65	2.40	2.30	2.25
	2 Year - 10 Year Spread	-0.02	0.04	0.03	0.19	0.29	0.33	0.35	0.75	0.78	0.77	0.75

Explore other market implied rates

…type CTM <GO> on Bloomberg…

There is a whole wealth of forward implied prices, globally…

First: Quantitative Easing Background

- QE is basically the relaxation of monetary policy conditions through the purchase of (generally longer-term) government securities on the open market by a Central Bank – in order to lower rates across the maturity spectrum, as well as to inject money supply into the financial institutions holding these assets (often by virtue of regulatory obligations – bonds can be part of banks' capital holding requirements).
- Three rounds of QE in the US followed the global financial crisis of 2008, an unprecedented expansion of the balance-sheet of the Fed and an enormous injection of capital into the market.
- Let's briefly consider why the FED embarked on three rounds of QE.

- (Remember, as opposed to the inflation targeting mandate of the SARB, the Fed has a mandate of inflation targeting and ensuring full employment.

First: Quantitative Easing Background

- QE: In the first round of bond buying by the Fed in November 2008, it began purchasing $1.25 trillion of mortgage-backed securities, $175 billion of agency debt and $300 billion of Treasuries (bonds) to provide further stimulus after the benchmark (IB borrowing) rate was cut to almost 0 in December 2008.
- In the second round, announced in November 2010 and lasting through the following June, the Fed bought $600 billion of Treasuries.
- It then took the spending to a next level… QE3 ($85bn p/m)

So how does Open Market Operations by a Central Bank work again?

- <u>Suppose the Fed wishes to stimulate economic activity:</u>
- The Fed purchases treasury bonds on the open market from dealers. The proceeds are then deposited in the dealers' banks (CB could also purchase bonds directly from banks' holdings).
- This increases the amount of reserves held by the banks, which exerts downward pressure on the prevailing interest rates (across the maturity span (REPO only influences short end of Yield Curve)
- This decrease in borrowing costs stimulates both consumer and business spending.
- (Vice Versa for contractionary policies, where the amount of money in the banking system is contracted…)
  - OMOs are primary RB tools (in addition to changing discount (repo) rates and reserve requirements)

ECB's own extreme expansionary actions

- Last year EU leaders were divided on the issue of ECB OMOs– particularly with stern opposition from the Germans and emphatic support from the French and Italians…
- With the Zero-Bound having been reached (with bank deposits at the ECB earning negative yields), the ECB had no choice but to announce QE-style asset purchases to further prop up banks with liquidity which they hoped will lead to increased lending activities and stimulated demand.
- This is all done to spur economic growth and (VITALLY) curb the threat of **DEFLATION.**

ECB Unveiling further expansionary plans

- What followed the zero bound breach in the short term ECB borrowing rate, was unprecedented: eight EU countries saw the short end of their yield curve dip below zero…
  - Germany, Austria, Belgium, Finland, France and the Netherlands, as well as non-euro-area nations Denmark and Switzerland saw negative two year rates following the announcement of expansion and the further lowering if the ECBs short rates, pushing these rates down further.
- But how can government bonds have a **negative** yield? We will discuss this at the end of the session, when we have discussed how bonds are valued…

Interest Rates (Usury)

The issue of interest (Usury) - philosophical background…

- Aristotle, 350bc: "Very much disliked is the practice of charging interest; and the dislike is fully justified … money intended to be a means of exchange … of all ways of getting wealth this (interest) is the most contrary to nature
- Cicero, 50 BC: "Gentlemen should not toil themselves with means of livelihood which provokes ill-will, such as collecting customs dues and money-lending"
- Various regulations & limitations from ancient times … usury & debt enforcement as common themes

Some more philosophical views on usury

- *"In the reformation and reglemation of usury, two things are to be reconciled: The one, that the tooth of usury be grinded that it bite not too much; The other, that there be left enough means to invite monied men to lend to the merchants for the continuing and quickening of trade"*
- *"It is a vanity to conceive ordinary borrowing without profit; Or the number of inconveniencies that will ensue if borrowing be cramped" – brilliantly put*
- ***"In defence of Usury", Francis Bacon, 1597.***

- *""The business of a moneylender … has no where nor at any time been a popular one. It is an oppression for a man to reclaim his own money: it is none to keep it from him. No man of ripe years and of sound mind, acting freely, and with his eyes open aught to be hindered with a view to his advantage, from making such bargain in a way of obtaining money as he thinks fit: nor any body from supplying him upon any terms he thinks proper to accede to"*

Bentham, 1787:

- *"Avarice & usury & precaution must be our gods for a little longer still … for only they can lead us out of the tunnel of economic necessity into daylight*

Keynes

Today: BOND INSTRUMENTS

- In light of these diverse views, we today discuss interest rates on borrowed money – and the dynamics underlying debt instruments.
- In particular we study debt instruments as one of the four pillars of promissory assets that can be held in financial markets mentioned in the last session.

- Such instruments remove the risk of deviations in return – specifying up front what the lender stands to benefit from lending her resources.
  - But in so doing, it introduces various other risks – the bulk of such risk in most cases defined as the ***opportunity cost*** of earning a higher return by holding a different promissory asset (such as equity).

Debt instruments

- Typically when we think of holding safe debt instruments in our portfolio we think of government bonds.
- There are, however, various types of debt instruments that investors can choose to hold – varying in terms of their rate flexibility, time to maturity, etc.
- In this session we will look at these different types of debt instruments and which factors influence investors' lure to hold them.
- Remember, we are still discussing which financial assets an investor can hold as a way of shifting consumption opportunities over time.

Money Market

- The first debt instrument type that we will discuss today is money market instruments (**MMI's**).
- These instruments are defined as such due to their **shorter maturity** schedules – they are typically debt instruments with a maturity of less than 12 months when created (in theory, a 20 year bond with 1-year left to maturity, can be considered a MMI → but this is not done in practice).

- The largest issuer of MMI's in SA is the government – which can issue Treasury Bills (T-Bills) to finance short-term debt obligations / roll over older debt obligations (helping balance books in a CA deficit).

Money Market

- An efficient market for short term debt instruments are **vital** in **ensuring short-term financing needs** of businesses and public institutions are met, while the information contained in the interest rates: provide an **efficient pricing mechanism** for interest rates in the market from 1 day (overnight loans) to 1 year rates.
- It's functioning is also vital for conducting **effective monetary policy** – as it is through these channels that liquidity is provided to banks (more on this under REPO discussion).

- For investors, MMIs are regarded as **safe**, **highly liquid** assets – although their returns are highly limited (the age old trade-off).
- Depending on an investor's preference → MMIs should at least ensure his capital **does not decrease** in the short-term.

Money Market

- Main types of Primary issuance of short term debt securities:
  - Private sector: Commercial Paper (CP), Promissory Notes (PN)
  - Public Sector: Treasury Bills (TBs), CP, Floating Rate Notes (FRN)
- Such debt instrument securities (MMIs and Bonds alike) are referred to as Fixed Income (FI) investments – as the **repayment schedules** accruing to the holders of such securities are **fixed** (or known up-front) – of course this is in contrast to equity assets (where returns may vary!)
- Important to note is that the name FI **does not imply** the **rates** are **fixed** necessarily:
- FI's can have fixed-rates (TBs), or variable rates (FRNs)
  - The same applies to bonds which are also termed FI investments.

Money Market – market?

- The money market in SA is not really a market. The sale and re-sale of short term debt instruments are largely unregulated – relying on mutual trust between market participants. This is known as an Over-The-Counter (OTC) market.
  - Of course, the institutions that can issue such instruments are large and credibility is vital – not repaying debts is not an option, hence the safety of the system is ensured implicitly
- Following the MM Forum, completed in 2002, all money market security issues have since been issued and kept electronically (under the STRATE system, see chapter 9), while the process has been standardized to streamline issuance and trade (enhancing liquidity) – the securities still remain unlisted, OTC Fixed Income instruments.

Money Market

- The secondary market for short-term debt instruments are rather limited – largely due to the shear size of these instruments (normally traded in R-millions).
  - Investors can hold money market instruments in collective investment scheme funds (discussed in more detail in a later session) – where pooled investment funds allow ordinary investors to hold a piece of an instrument.
- As with all FI's, remember that the Bid / Offer spread is counterintuitive: as these instruments are quoted in terms of the interest rates applicable. Thus a typical Bid / Offer spread would look like:

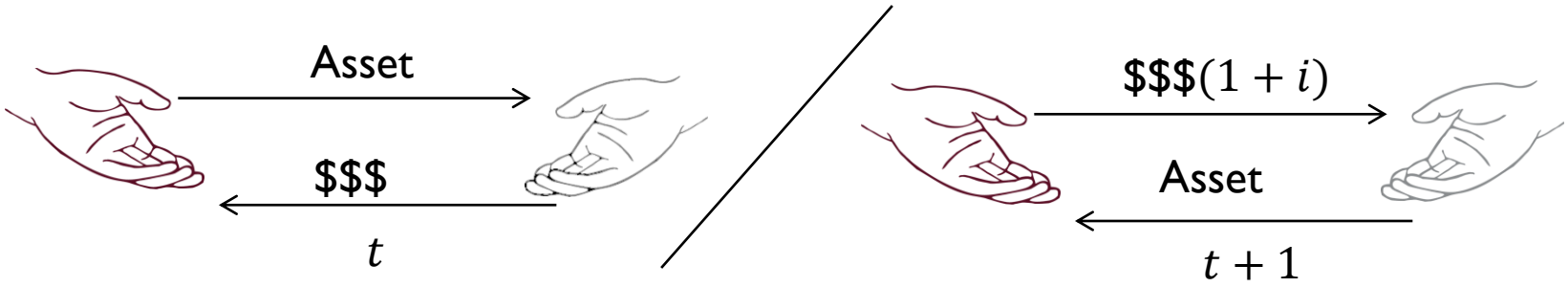
BID (what investors bid to buy at) / **OFFER** (what holders offer to sell at)

7.8% 7.75%

If it was quoted in prices (like shares), the Bid would always be lower than the Offer! – For FI's a higher (lower) rate implies a cheaper buy (higher sell)

Money Market - REPOs

- Repurchase Agreements (**REPOs**) are some of the most widely used MMIs in the world. Essentially, these imply the sale of and simultaneous agreement to repurchase the asset at a future date, for the original value plus interest (repurchasing typically of short duration – often overnight).



- In SA most REPO agreements have government bonds as underlying collateral (the **asset** in the top figure) for the transaction (ensuring the safety of the Repo seller). As bonds only mature at a later date, using them as collateral to hold REPOs for a short period (and thereby meeting ST liquidity demands) is a crucial function in the economy – and ensures ability to raise short-term capital.
- Under a REPO agreement, in contrast to normal collateralized debt, the **ownership of the security** (say the bond) **is transferred** for the period between selling and re-buying it at a later stage, but oddly enough – income accrued on it (e.g. dividend payments) is paid to the initial owner (not the interim owner)

Money Market - REPOs

- This short term debt obligation is important for the efficiency of monetary policy in SA.
- The SARB conducts Repo agreements with domestic commercial banks: requiring them to enter into 7-day Repo arrangements, with the amounts auctioned by the relevant parties. The rate at which this occurs, however, is set by the SARB's MPC (Repo rate).
  - CB is limited to purchasing **secondary** MMIs from pvt banks in SA under its REPO system, first creating shortages (through its mandate) and then providing liquidity.
- This is a useful monetary policy tool in SA, as most of the banks' own lending rates are adjusted according to the rate they can borrow against from the SARB.
  - The SARB also conducts open market operations (though not yet at the scale of what the ECB plans!) as a means of conducting monetary policy → thereby influencing the liquidity in the money market.

Important Money Market benchmark rates

- In addition to the very important Repo rate, there are several other key benchmark rates derived from Money Market:
- Interbank overnight rate: If a bank has a negative balance relative to the SARB at day's end – it must borrow at REPO + 100bp. Thus banks having a surplus tend to lend to those in deficit, as the latter earns only REPO - 100bp, so that they can both be better off. These are highly competitive rates and are as such not disclosed by individual banks (only aggregate is observed).
- Treasury Bill (TB) rates: Serve as a benchmark indicator of money market conditions.
- SABOR (SA Benchmark for Overnight Rates on Deposits): Published by SARB, this is a weighted rate based on several underlying aspects of overnight bank lending (including inter- and non-bank lending).
- JIBAR (Johannesburg Interbank Agreed Rate): Published by JSE, this represents SA money market interest rates on longer term deposits (up to 12 months), as determined by a number of domestic and international banks. As with the contentious LIBOR rate, banks are polled daily and asked for Bid / Offer midpoints for 1, 3, 6 & 12 month deposits.

Money Market Funds

- Often regarded as a very safe investment vehicle – MMF's are open-ended mutual funds that are mandated to invest in safe assets (typically including T-Bills, Commercial Paper (short term funding for large institutions), etc).
- These MMFs are considered ***verrrry*** safe – and have a very low maturity of the underlying assets.
- As this is the case – we expect mutual funds to always **at least** preserve your capital, plus provide you with some returns in the form of interest. Although not the highest returning funds – they typically provide the safest bet in terms of protecting the capital base and should at the very least not lose you any money (they should not **break the buck**)

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

Bond Market

Department of Economics

DEPARTMENT OF ECONOMICS

Bond Market

- Similar to a MMI, bonds are longer term debt securities that offer investors safe, fixed income alternatives to the potentially volatile share market.
- A bond is essentially a financial transaction, where the buyer (holder of the bond) lends money to the issuer (which include governments, businesses and various other large institutions) – that is repaid according to some pre-defined fixed structure.
- Much of the same applies as with MMIs, with these longer term FI instruments also coming in various shapes and sizes, tailored to most investment needs.
  - They can have fixed repayment rates or variable rates (Floating Rate Notes, FRNs, tracking benchmark rates or indices like the CPI), have finite horizons (repayment of the initial amount at maturity) or infinite horizons.

Bond Market

- Bonds are **vital** to the **functioning of economies** across the globe, as governments use such debt obligations to fund spending, in the hope that it will be justified if repaid by the returns from future economic growth (like South Korea's debt-spending on infrastructural development in the 70s and 80s now fully justified by their massively expanded tax base).
- Essentially **faced with** the choice of funding public spending either via **taxation or debt**, too much emphasis on the former can lead to inefficiencies (think Laffer-curve for tax rates), while funding spending using debt can limit inefficiencies and dead-weight losses caused by taxation.
  - Of course over-indebtedness, as seen in many EU countries currently, can cause debt funding pressures, and expose their fiscal balance-sheets to volatile market rates – as risk is priced into such rates – implying re-financing / rolling over debt can put a serious drain on the public sector (causing a spiral of indebtedness)

Bond Instrument: How it works

- Bond instruments have a **fixed pre-specified** interest and repayment schedule printed on the face of the instrument (and will remain as such until maturity)
- An example of such a bond in SA is the 30-year R209 Bond, issued on 21 July 2006:

REPUBLIC OF SOUTH AFRICA INTERNAL REGISTERED BOND
R209 (6,25 % COUPON)
REDEEMABLE ON 31 March 2036

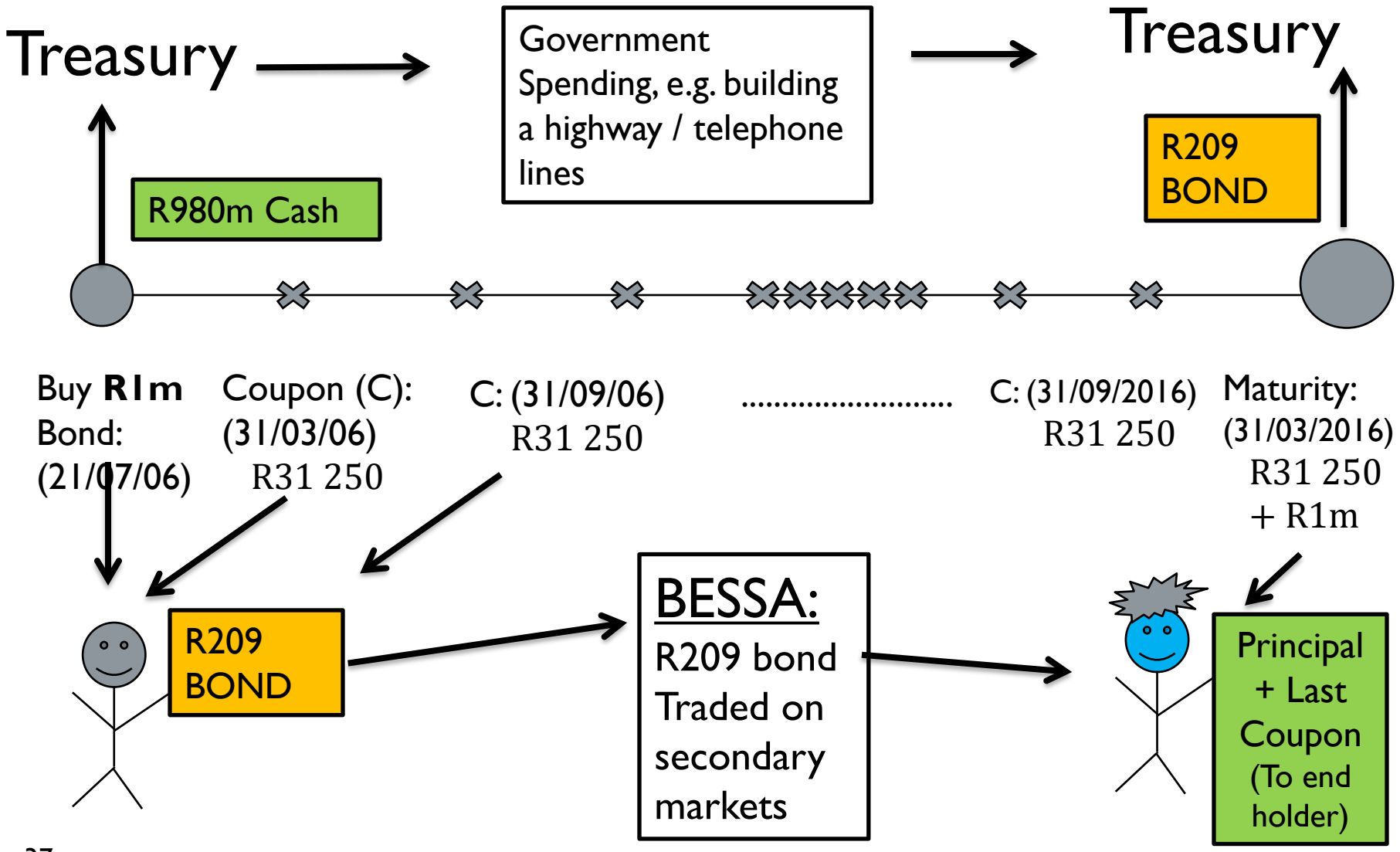
- R209 is the BESA code (name of the bond) for reference to future buyers on secondary markets.
- **Coupon** implies the interest payments made to the holder of the bond.
- The **Redeemable date** is the date on which the principal payment made for the bond is repaid to the holder of the bond at that time.
- 31 March 2036 is the **maturity date** of the bond.

Bond Instrument: How it works

The R209 Bond issued in 2006 :

- is known as a **fixed rate** (or **vanilla**) bond. (coupon is fixed at 6.25%)
- coupon payments (of 6.25% annually) are made on a **semi-annual** basis, thus the holder gets a coupon on **30 September** and **31 March** each year until 2036.
- The bond was sold at a discount to the **principal amount** [this is the **amount that will be repaid** to the holder of the bond on the maturity date in 2036] , with an issue price of R77.846%.
  - Thus, if someone bought a R1m R209 bond in 2006, he would have paid: $R1000\,000 * 77.846\% = R778\,460$ for the right to hold the bond, and if held to maturity would receive R1m in 2036.
- Holding a R209 bond with a principal of R1000 000 would imply coupon payments of: $\frac{6.25\%}{2} * \mathrm{R}1000\,000 = \mathrm{R}31\,250$ every 6 months.

Schematic of the R209 Bond



Bond Instrument: How it works

- Running yield: This gives an indication of the income received from buying a particular bond (expressed as a % per annum, e.g. 5% p.a.).

Remember that the coupon is **fixed**, but the price on secondary markets for a bond is **variable** (determined by supply & demand)**.** Thus:

$$\text{Running yield} = \frac{\text{Annual Income holding bond}}{\text{Price paid for bond}}$$

Thus for the R209 that an investor paid for at the issue price of R77.846%:

$$\text{Running yield} = \frac{62\,500}{778\,460} = 0.0803 = 8.03\% \text{ running yield}$$

Because the Coupon payments (6.25%) and the maturity date are both fixed, the higher the price of a bond, the lower the return (or yield), and vice versa $\uparrow \mathbf{P} \rightarrow \downarrow \mathbf{yield}$

YTM

- The **Yield-to-Maturity** adds to the running yield by taking into account the price paid for the bond, what it pays out at maturity and also the time to maturity. This way you get an idea of what you will earn on your investment (what you paid for the bond)
- E.g. suppose a $1m 5% bond is sold
  - If the $1m Bond sold for $800k, the investor will have a **capital gain of** $200k.
  - The investor will also get a bi-annual coupon of 5% p.a. (paid bi-annually)
  - The YTM is then calculated by taking these two factors (coupons and capital gain) into account, and discounting it to the present.
  - Doing so gives us the YTM – which makes different bonds comparable in terms of the yield if the bond is held to maturity.

Valuing of Bonds

- The convention used to value a bond is the yield-to-maturity (**YTM**) measure – as it incorporates the **cash-flow** of the bond, relative to the price, over the entire lifetime.

- From: $$P = \frac{C}{(1+i)^1} + \frac{C}{(1+i)^2} + \cdots + \frac{M}{(1+i)^n}$$

- We have : $\mathbf{YTM} = \mathbf{i}$, that makes the top equation true (given we know the Coupon, C , Price, P, and Principal payment, M, upfront).

- SA bonds are always **quoted** in terms of their **YTM** (although, of course, settled in price)– so as to **enable us to compare** different types of bonds… as the rate says more than a price!

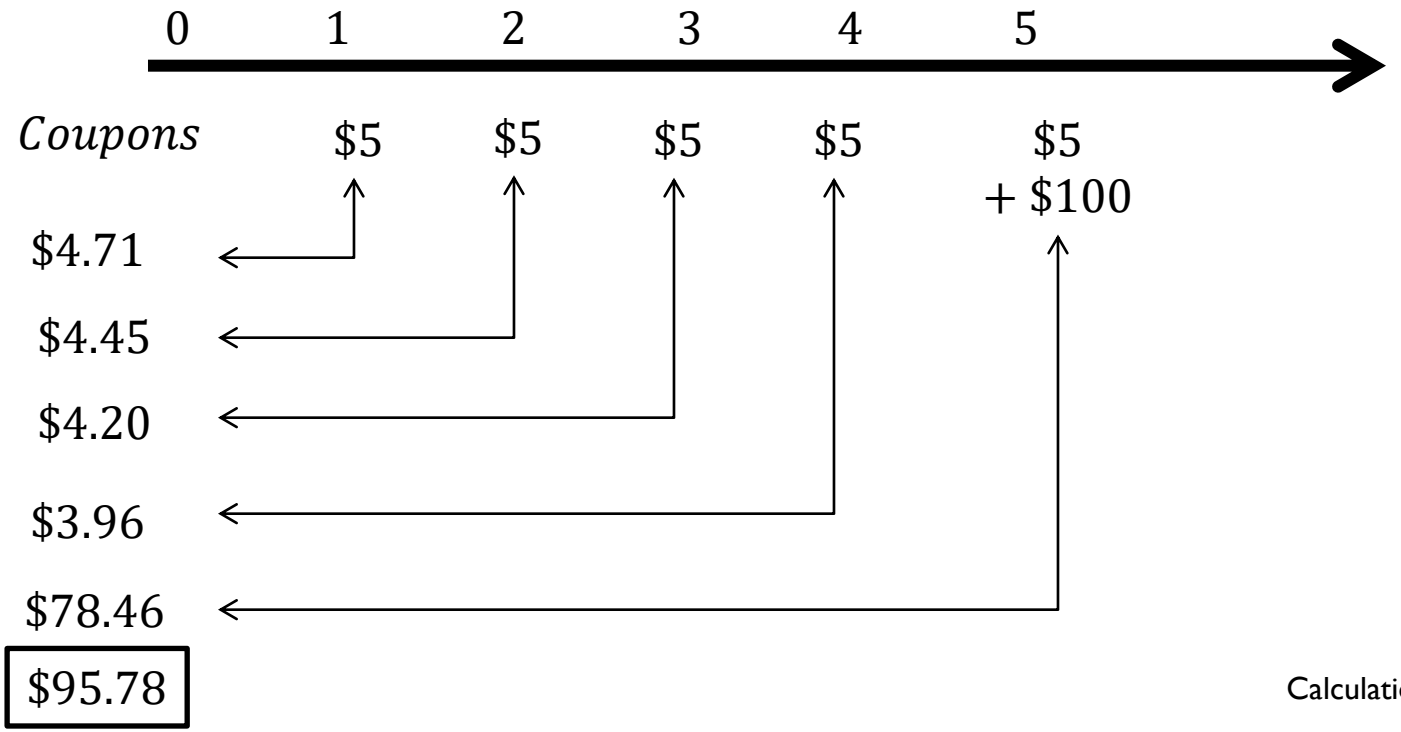
YTM

- Thus YTM is the **implied rate** (i) given what investors are willing to pay (at prevailing market P) for a bond instrument with a given coupon and principal structure.
- The fact that it is implied by the market, means that we can deduce from it how investors view market conditions, what their rate of time preferences are, etc.
- As we saw with the running yield, a distinctive feature of a debt instrument is the **inverse relationship** between the YTM and the Price of a bond.

YTM graphically

Suppose we have a bond with maturity of 2.5 years (hence 5 coupons), 10% coupon rate p.a. ; YTM of 12% and a principal of $100 (thus a $5 coupon bi-annually)

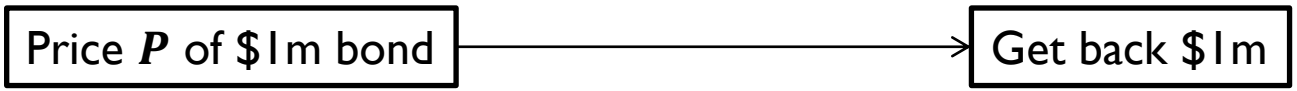
The price then should be: $\$95.78 = \frac{5}{(1+12\%/2)^1} + \frac{5}{(1+12\%/2)^2} + \cdots + \frac{105}{(1+12\%/2)^5}$



Calculation Source: BESA

Inverse relationship: Price and yield

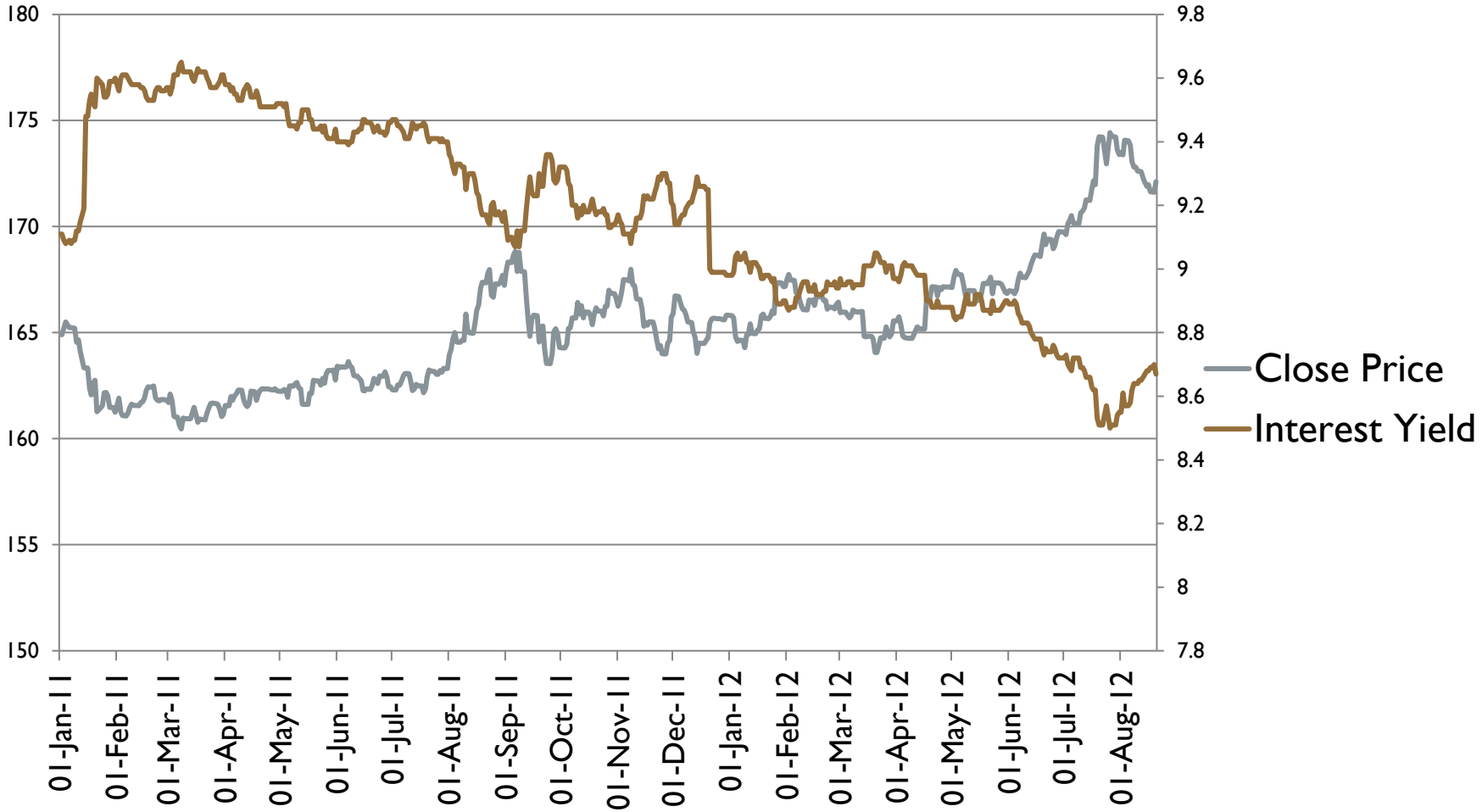
- To understand this, consider the simple example of a zero coupon bond:
- Suppose government sells a $1m bond with maturity in one year at an auction.
  - It effectively sells a promise to pay the holder of this paper $1m in one year's time



Now suppose you paid P =$980 000 – the implied yield is then: $1m / 980 000 = 102%

Which gives a 2% yield.

Suppose that rates in the market rise to 5%. This then needs to be reflected in the bond rate as well, e.g. the price of the $1m bond you hold only sells for $950 now, giving a yield of 5% (1m / 950 000)


180
175
170
165
160
155
150
9.8
9.6
9.4
9.2
9
8.8
8.6
8.4
8.2
8
7.8
01-Jan-11
01-Feb-11
01-Mar-11
01-Apr-11
01-May-11
01-Jun-11
01-Jul-11
01-Aug-11
01-Sep-11
01-Oct-11
01-Nov-11
01-Dec-11
01-Jan-12
01-Feb-12
01-Mar-12
01-Apr-12
01-May-12
01-Jun-12
01-Jul-12
01-Aug-12
Close Price
Interest Yield

WAIT! Do not get confused here…

- When current interest **rates** in the market **rise**, prices of outstanding bonds (or not yet matured bonds, like the R209) **need to fall** in order to bring the yield of such bonds in line with the higher interest bearing new issues, linked to the higher current market interest rate!
- Thus, it is **not** that the **coupon rate** on an outstanding bond **changes** (remember that is **fixed**), **but** rather prevailing **market interest rates** (and therefore new bond issues that are priced according to higher market rates) **that change** → **causing** the **price** of the bond **to adjust** so that the implied yield (or YTM) of the bond gets closer in line with what's happening in the market. *[Look again at the Pricing equation on slide 36]*

!
- As in equity market efficient hypotheses – we assume such corrections happen infinitely fast, leaving no traces of potential arbitrage, though there always are !

WAIT! Do not get confused here…

As an example:

- Suppose you own a R1m R209 bond that has on it a fixed Coupon Rate of **6, 25**%.
- Suppose that a year later the prevailing market interest rates have risen due to monetary tightening by the SARB (raising the REPO rate, e.g.)
- This implies that **similar bond instruments** to that of the R209 that is issued now pays Coupon Rates of say 8%...
  - How can you then sell your bond that has a fixed rate of 6.25% when the investor could rather buy a higher Coupon bond from treasury directly?!
- <u>The answer is simple:</u> You lower the price of your bond, and sell it at a larger discount, so that the YTM of your bond (or the remaining lifetime cash-flow) roughly equates that of the prevailing market rate bond's YTM.

Other factors also NB

Of course other factors are also important in determining the price that buyers of bonds are willing to pay, such as…

- Appetite for risk (as bonds are considered safe, when markets are considered risky the demand for bonds typically increase)
- Inflationary fears and interest rate hikes (locking in capital at fixed rates are not preferable to investors when: a) inflation is rising & b) interest rates are expected to rise, or especially a combination of both)
- FED QE conundrum last year – with the FED purchasing great amounts of US Bonds under QE, the demand is high. If they taper (or are perceived to taper), demand will decrease generally – with a corresponding drop in prices (and a subsequent rise in yields) to follow. This is what Bernanke tried to reverse when he announced the possibility of tapering in May…

Pricing of a bond

- Before looking at the implied YTM further, let's consider how the bonds are **actually** priced. Much like shares after a dividend pay-out, bond prices drop after coupon payment cut-offs (i.e. holding it before such a cut-off time implies the next coupon accrues to the current holder).
- Thus knowing when these dates are is an important piece of information to potential buyers.
  - **LCD**: Last Coupon Date (date of last payment)
  - **NCD**: Next Coupon Date
  - **BCD**: Book Closed Date (cut-off date for the accrual of coupon payment – last day is known as the Last Day to Register, or LDR)
  - **Between** the **LCD** and **BCD**, known as ***Cum-interest***, buying the bond entitles the holder to the next C, while buying in the interim (after BCD and NCD, called the *Ex-interest* period) entitles the previous holder to the Coupon.

Pricing a Bond

The **all-in price** (AIP) of a bond is then the price that takes into consideration the :

- Clean Price: What the market prices similar bonds at (considering factors such as the principal, coupon rates, time to maturity, market risk, current interest rate levels, etc.).
- Interest to be added / subtracted (i.e. the amount of interest that is owed to the current holder if bought *cum-interest*, or required if in *ex-interest* period).
- The price is then determined with typical demand / supply factors.

Bond Price Dynamics: Volatility

- The **volatility** of bond prices indicate the sensitivity of a bond's price relative to a change in the yield rate of similar bond yields in the market
- This price volatility is known as Delta.

$$\text{Delta} = \frac{d(\text{All in Price})}{d(\text{Market Yield})}$$

  - Thus if we know Delta, we can calculate the expected change in the AIP of a bond **given** a change in the market Yield.
  - Thus if a bond's price is **highly sensitive** to a yield rate change (i.e. if Delta is very large), we refer to the bond price as being more volatile.
  - This follows as market rates can easily change (depending on news, events, etc.), which would by default imply prices also tend to vary rather often.

Duration

- The bond price is not only influenced by interest rate changes, but also by various other factors, including the time to maturity and the size of the coupon rate.
- Loosely speaking, a bond's **Duration** is an indication of the time it takes for the discounted cash-flow of a bond to equal the price paid for the bond.
- The discounted cash-flow of a bond is the discounted **Coupon payments** : $\sum \frac{C}{(1+i)^n}$, plus the discounted **yield** : $\frac{n*M}{(1+i)^n}$
- Thus a zero coupon bond's duration would be equal to its maturity… Hence calculating the Duration of a Coupon paying bond is like finding its equivalent Zero-Coupon identical! (Here a vanilla bond's Duration is a function of the size of the Coupons and Yield of the bond).

Calculating Duration

- The formula for Macaulay's Duration (from Macaulay, 1938) is simply:

$$D = \frac{t_1 * PV(CashFlow)_1 + t_2 * PV(CashFlow)_2 + \cdots + t_N * PV(CashFlow)_N}{(k * PV(Total\ CashFlow)}$$

- With $PV(CashFlow) \rightarrow$ the discounted cash-flow for period t_x
- $PV(Total\ CashFlow) \rightarrow$ total cash-flow to holding security
- $k \rightarrow$ number of coupon payments per year.
- All the discounting to the present value uses the YtM.
- Thus if we have: Semi-Annual Coupon = 8%, Term to maturity = 5 years, YtM = 8%, Price = $\$100\ldots$
- Then we calculate the **Macaulay Duration** as … (example from *Fabozzi, Pitts & Dattatreya*)

Duration example

Period (t)	Cash Flow (Coupons)	PV(CashFlow)	txPV(CashFlow)
1	4	$\frac{4}{(1+i)^t}$ =3.84	1*(3.84)
2	4	3.69	2*(3.69)
3	4	3.55	…
4	4	3.41	…
5	4	3.28	…
6	4	3.16	…
7	4	3.03	…
8	4	2.92	…
9	4	2.81	9*(2.81)
10	100+4	70.26	10*(70.26)
	Total	**100**	**843**

$$\textbf{Macauly Duration} = \frac{843}{(2*100)} = 4.21$$

Duration

- Practitioners normally use the Modified Duration, taking into account **changes** in the **market interest rate** (and how it will affect the bond's price and thus its yield) Thus **Modified Duration** ($\boldsymbol{D^*}$) of the previous Bond:

$$D^* = \frac{Macualy\ D}{(1 + yield/k)} = \frac{4.21}{(1 + \frac{0.8}{2})} = 4.055$$

- To get a measure of a bond's sensitivity using Modified D*, the following applies:

$$\frac{\Delta P}{P} = -(D^*).\Delta(market\ yield\ or\ market\ rate\ i)$$

Thus, in the example above (where $\mathrm{D} = 4.21$ years and $\mathrm{D}^* = 4.055$):

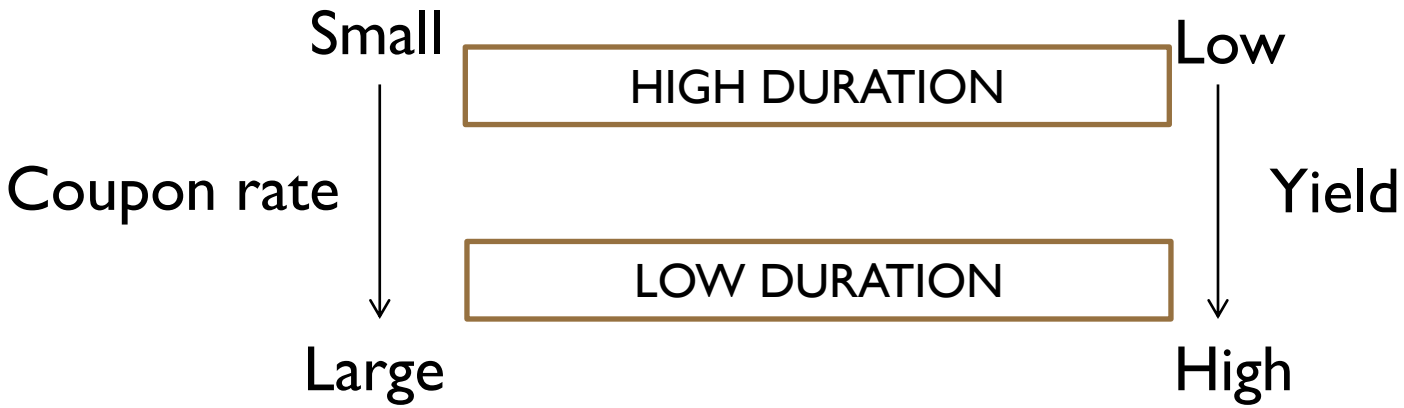
if the market rate $\boldsymbol{i}$ $\uparrow$ **by 1**% (e. g. goes from 8% to 9%) $\rightarrow$ then **P of the bond**

$\downarrow$ by **approximately 4. 055**%

Thus for our previous bond, if rates rose by 1% - we expect the Bond to sell for $95. 95

Duration

- Important to see from the Duration measure is that the larger the Modified Duration of a bond – the **more sensitive the price** to a change in market rates.
- More sensitivity = more volatility.
- Now as **Duration** (by definition, think about it) is **larger for** bonds with: **Longer maturities** ; **smaller Coupons** & **lower yields…**
- And higher D → higher interest rate risk (variance potential)→ greater premium on prices i.t.o. sensitivity…
  - Then if you have two bonds with the **same time to maturity** and **similar yields**, the one with the lowest Coupon should see the most volatility in price…



Typically we interpret the Duration as:

Higher D $\rightarrow$ Higher i $-$Risk

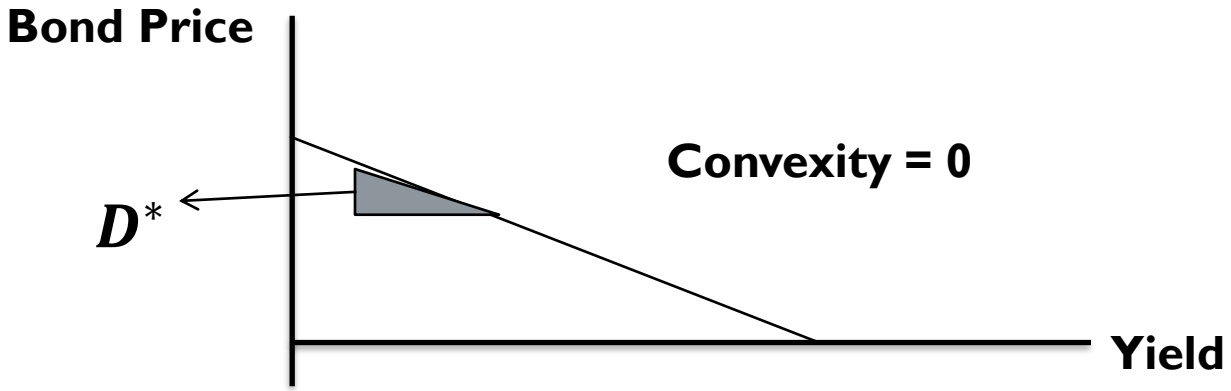
Usefulness of Duration

- Duration is then essentially a single number (measured in years / months) that is very useful in characterising a bond / debt instrument; by converting the complex cash-flow structure of bonds into a single number, again as Duration **approximates the sensitivity of the bond price (mkt value) to rate changes**.

- Using the Modified Duration as in the previous example – is accurate for small yield changes, but typically is non-linear in terms of level (large vs small changes) and sign of change (negative news outweigh positive typically).
- Also, Duration is often regarded as the **Beta** measure for Bonds. Can you see why?

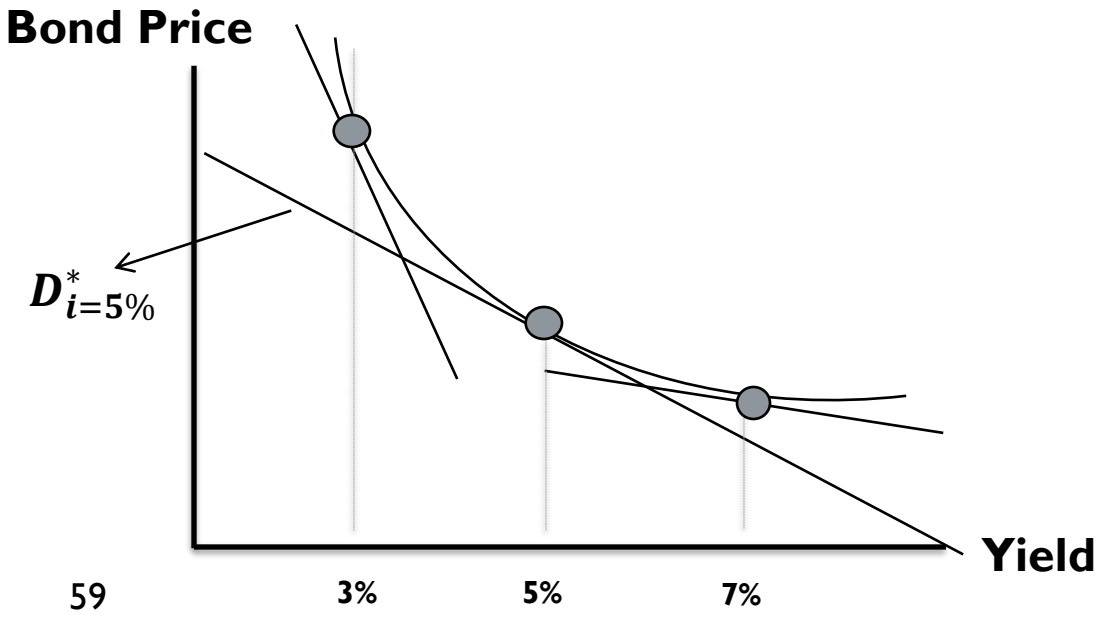
Bond Price Dynamics: Convexity

- Modified Duration is essentially the first order derivative of bond prices wrt yield changes.
- If we take **the second order derivative** of a bond's price wrt the market's yield, we can infer a bond's **pricing convexity**.
- This is useful to know, as we should expect the impact of a yield change to the bond price to be dependent on the **size** of the change in the yield.
- If the price change following a yield change **remains constant** for **any level** of yield change, we would have a straight line as:



Bond Price Dynamics: Convexity

- However, we normally see that the price / yield relationship is more convex – i.e. a relatively larger price change for larger yield changes (why? Think risk aversion).
- The more convex a bond pricing schedule – the more it bends out from the straight line. Of course, we also expect a leverage effect (implying that positive yield impacts weigh differently from negative impacts – i.e. bad news affect prices more than good news!)



Convexity > 0:

Note from the figure that if a $i = 5\%$ and the bond has Duration= D^* and i goes to 7%, the impact on price would be less than suggested by the D^* (vice versa for rate decrease).

Also note: $(D^*) \downarrow$ **as** $(i) \uparrow$
If convexity is > 0
And vice versa

Convexity / Duration

- Both Convexity and Duration convey the importance of market rate changes to the price (value) of a bond instrument. It thus explains the potential variability (risk) to holding the instrument.
- From the previous slide, you might note the following:
  - As interest rates rise and bond values fall, convexity **reduces** the impact of duration.
  - As interest rates fall and bond values rise, convexity **increases** the impact of duration.
- Note also that: **Higher Coupon pmt = Lower Convexity** (typically)
- If the interest rate **movement** in the market is **small**, or the **duration** of the bond is **low** → convexity matters less (and *vice versa*).
- Thus convexity and D^* should be used together when assessing the investment risk associated with interest rate movements. $\%\Delta P \; due \; to \; convexity$ is:

$$\%\Delta P \; due \; to \; convexity = 1/2\text{x}(\text{convexity})\text{x}(\Delta i)^2\text{x}100$$

Illustration of combining D^* & convexity

- Suppose we take the R157 bond (on a later slide).
- We can calculate what the expected impact would be if the market i would ↓ $100bp$ *:*
- $D^* = 1.75$
- Convexity $= 4.05$

Then the impact of a price movement if $i \uparrow 100\ bp$:

- $\%\Delta\ due\ to\ duration = -1.75 \text{ x } (-0.01) \text{ x } 100 = 1.75\%$
- $\%\Delta\ due\ to\ convexity = \frac{1}{2}\text{x (convexity) x } (\Delta i)^2\text{x}100 = 0.02\%$

Thus:

- Expected $\Delta\%P = 1.75 + 0.02 = 1.77\%$ change in the price of a R157 bond
- (*Note: Impact of convexity always positive – thus duration always underestimates the impact of a Δi on price

YIELD CURVE

Yield Curve

- Because bonds (typically) can be **stripped** :
  - Implying they can be sold off in smaller pieces with varying maturities (like shortened / mini versions of the larger bond) so that there exists an **entire spectrum** of yields for nearly all maturity dates (say the first four Coupons of the R209 was sold – it would imply a "bond" was created with a time to maturity of two years and annual coupon of 6.25%)

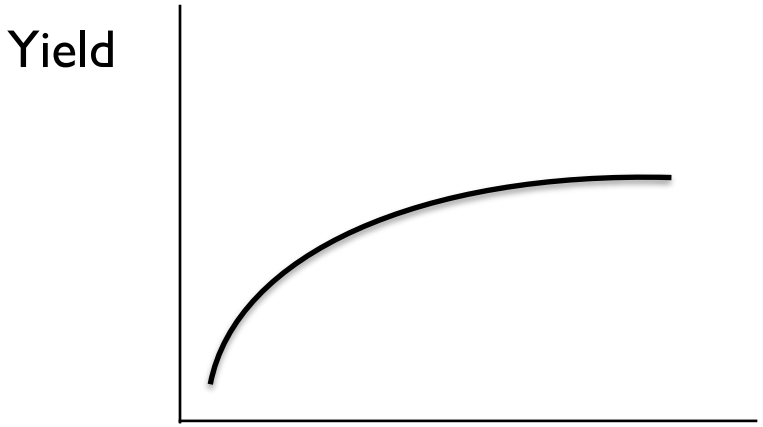
- This means we can draw a smooth curve depicting the yields required by investors to hold bonds for nearly all maturities (from 3-month to 30 years, assuming they can be stripped and sold off accordingly) at current prevailing market rates.

Yield Curve

- The maturity of a bond is important in determining the yield on a bond. We call this the *Term Structure of interest rates* and we normally see an **increase in** the **required yield as** the **time** to maturity **increases**.
- This follows as we expect investors to require a **time-premium** to compensate for deferred consumption (rate of time preference), and due to a longer time to maturity exposing a bond to more uncertainty = more risk = premium in terms of higher yield required.
- Such **time-uncertainty** risks to a bond's repayment also **includes**:
  - Inflation risk, default risk, interest rate changes risk (remember your Coupon rate stays the same while the market's may change), ER risk and liquidity considerations.

Yield Curve

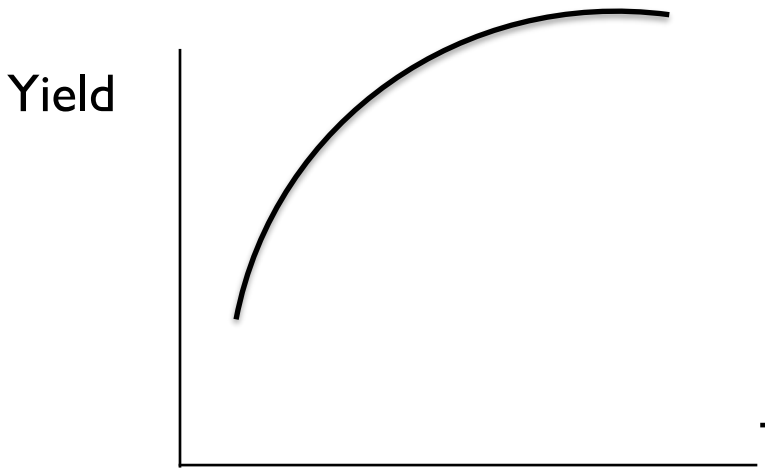
- We expect the yield curve, being a curve relating yields on Bonds with similar risk profiles to the Time-to-Maturity, to be positively sloping, with a decreasing rate as the maturity increases. Thus a typical YC looks like:

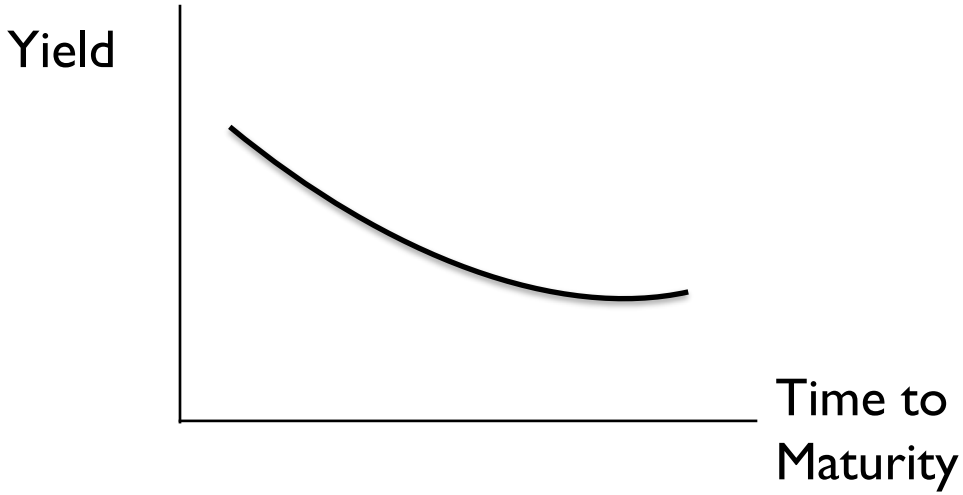


The gvt bond **yield curve** is used as a benchmark for other debt instruments in the market – such as mortgages, bank lending rates,…

- The yield curve tells us a lot about the market's sentiment regarding short-term and long term views on output growth, political instability, social unrest, future inflation rates, future interest rates, etc.

Yield Curve



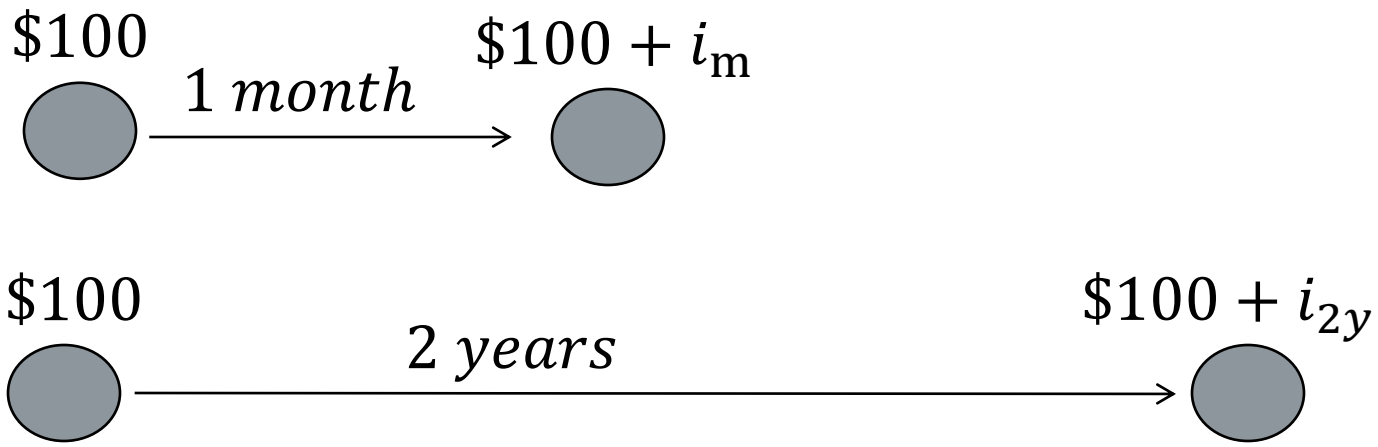


- <u>Steep upward sloping curve:</u>
- Investors may be uncertain as to the future in the markets as regards interest rates, inflation, liquidity concerns, default risks, etc.:
  - Thus requiring larger compensation to keep bonds for longer periods.

……

- <u>Decreasing slope:</u>
- Investors may have negative sentiments or fear a recession - requiring therefore larger premiums to lock up there funds in the ST – while being less pessimistic about the longer term.
  - It may also be in anticipation of lower rates in the future, spurring demand in LT debts (driving ↓ LT yields)

Is this logical?



- Consider the top examples where you lend $100 and the maturities are 1 month and 2 years respectively. Suppose we then annualize the rates.
- Why should there be a difference in the interest rate quoted when we express the rates in a common maturity framework, i.e. we make i_m & i_{2y} annual rates?

  Typically – investors require a larger amount of interest per annum for longer maturities, as there are more uncertainty when the time-frame increases (not always the case, e.g. in a decreasing slope YC)

Long Run Risks to bond holders

- Bondholders fear two things most highly:
- Future interest rates and Inflation

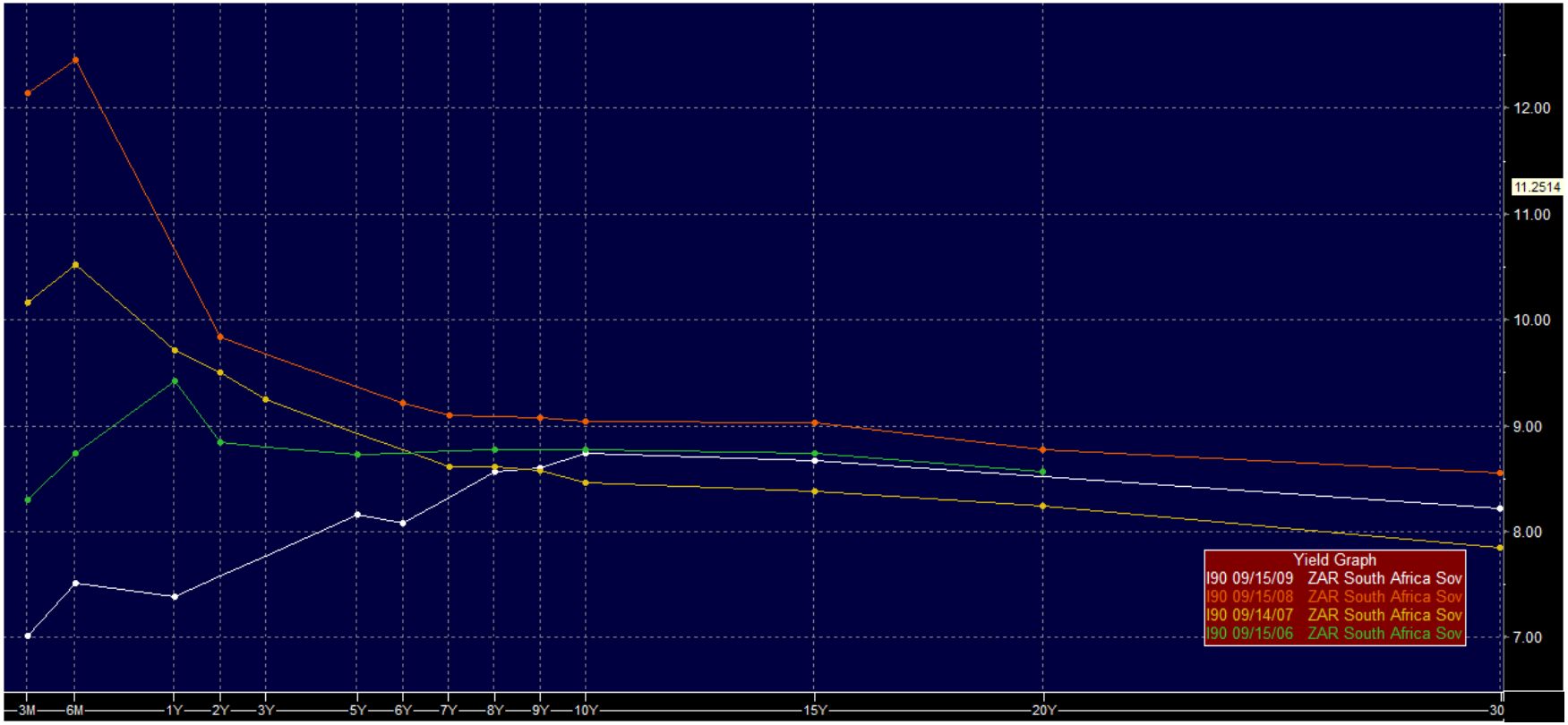
- If future interest rates are higher than the coupon rate on the bond in your portfolio, it implies a capital loss (as the bond would now sell for a lower price to compensate for the lower coupon!)
- Inflation erodes the value of the money repaid in the future. Runaway inflation implies a deflation of the value of the principal repaid at maturity and the coupons in the interim.

- Also, for foreign holders of bonds, the **exchange rate** impacts the effective return to holding a bond.

Yield Curves for SA on 15 September: For all the years 2006 – 2009

(Source: Bloomberg)

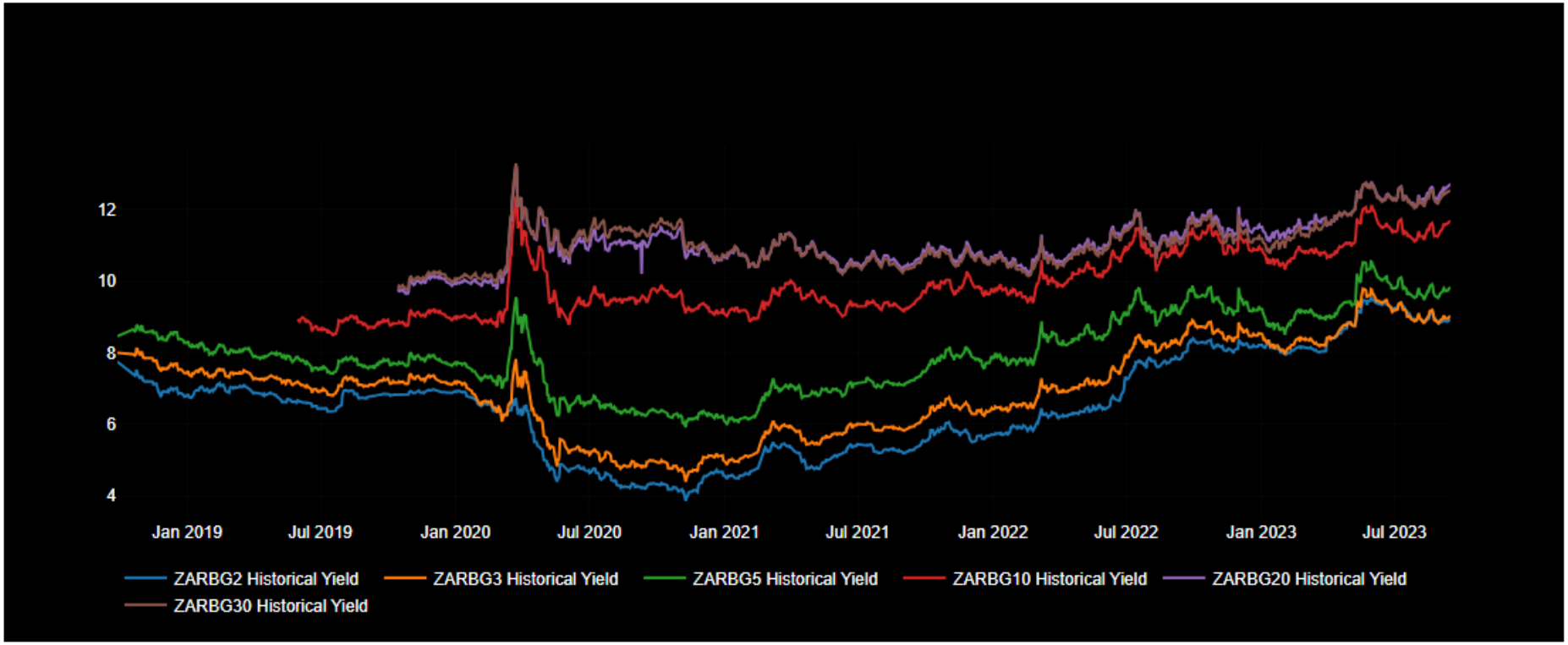
- Notice the inverted Yield Curve in SA leading up to 2008 GFC…



…get this by typing YCRV <GO> on Bloomberg…

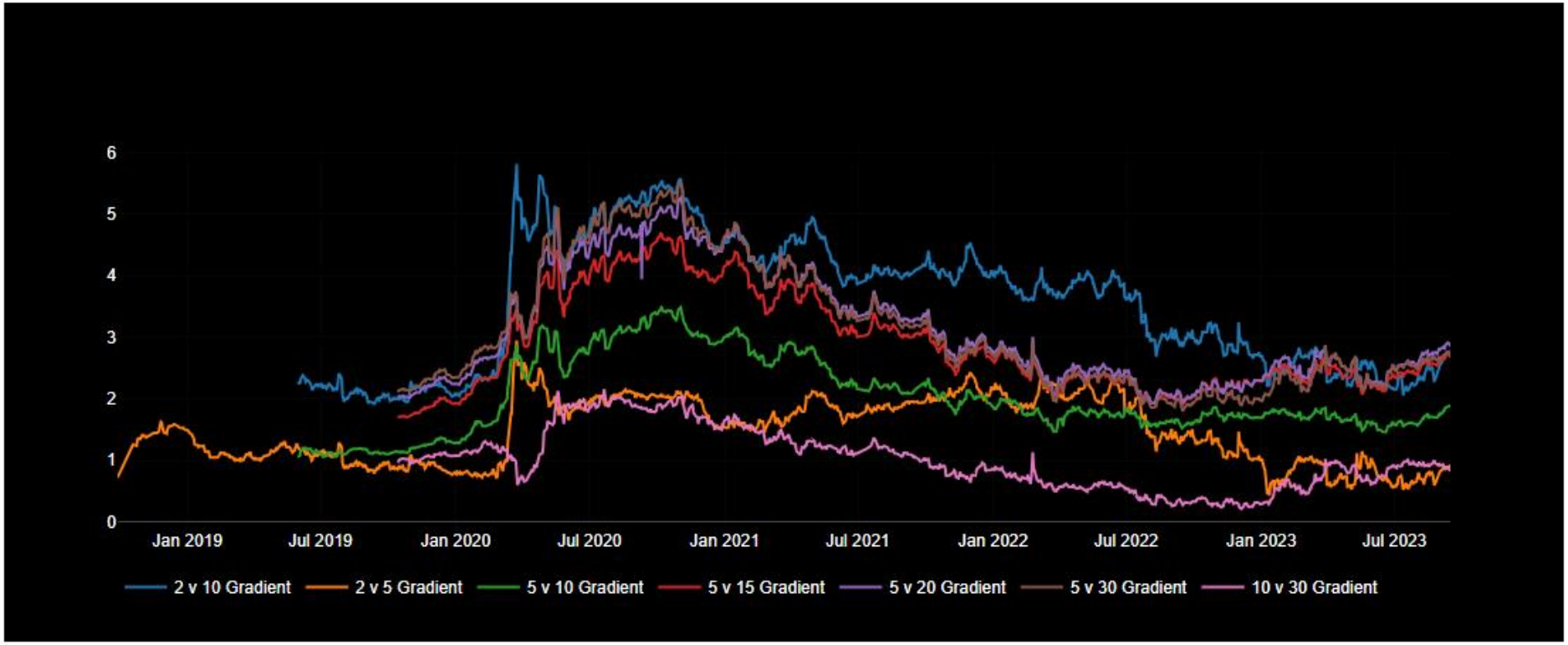
SA Yield Curve (Sep 2023)

Historical Yield Time Series



SA Yield Curve (Sep 2023)

Historical Key Generic Bond Term Spreads



How can a bond have a negative yield?!!

- We can think of a negative yield in the following way:
- Suppose a bond has a principal of $1000, and a coupon of 1%. Then, if the bond is in high demand and is sold at a premium (price > $1000), e.g. $1100 – it might drive the YTM of the bond to negative.
- **IT DOES NOT MEAN THE COUPONS ARE NEGATIVE – as this would imply a cash-flow burden of actually paying the government bi-annually…**
- This brings into question…Why would anyone **buy** a bond at such a high price so as to incur negative yields?
  - The perceived safety of the bond (e.g. German bond)
  - Strong bonds being seen as insurance against a EURO break-up (Think why?)
  - No safe alternative in the bond markets – where pension funds, e.g., are mandated to hold Fixed Income securities

The world should've exploded, but didn't…

- In July 2016, Germany auctioned off the first **negative-yield** 10-year bond ever.
  - Madness – a **10 year bond** with a negative yield of -0.05% **at auction?!**
  - This means, investors who hold the paper get back less than they paid for.
  - See here: https://www.ft.com/content/95cfdf42-5b96-3df7-8758-c8fe723715e7

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Bond Types

Department of Economics

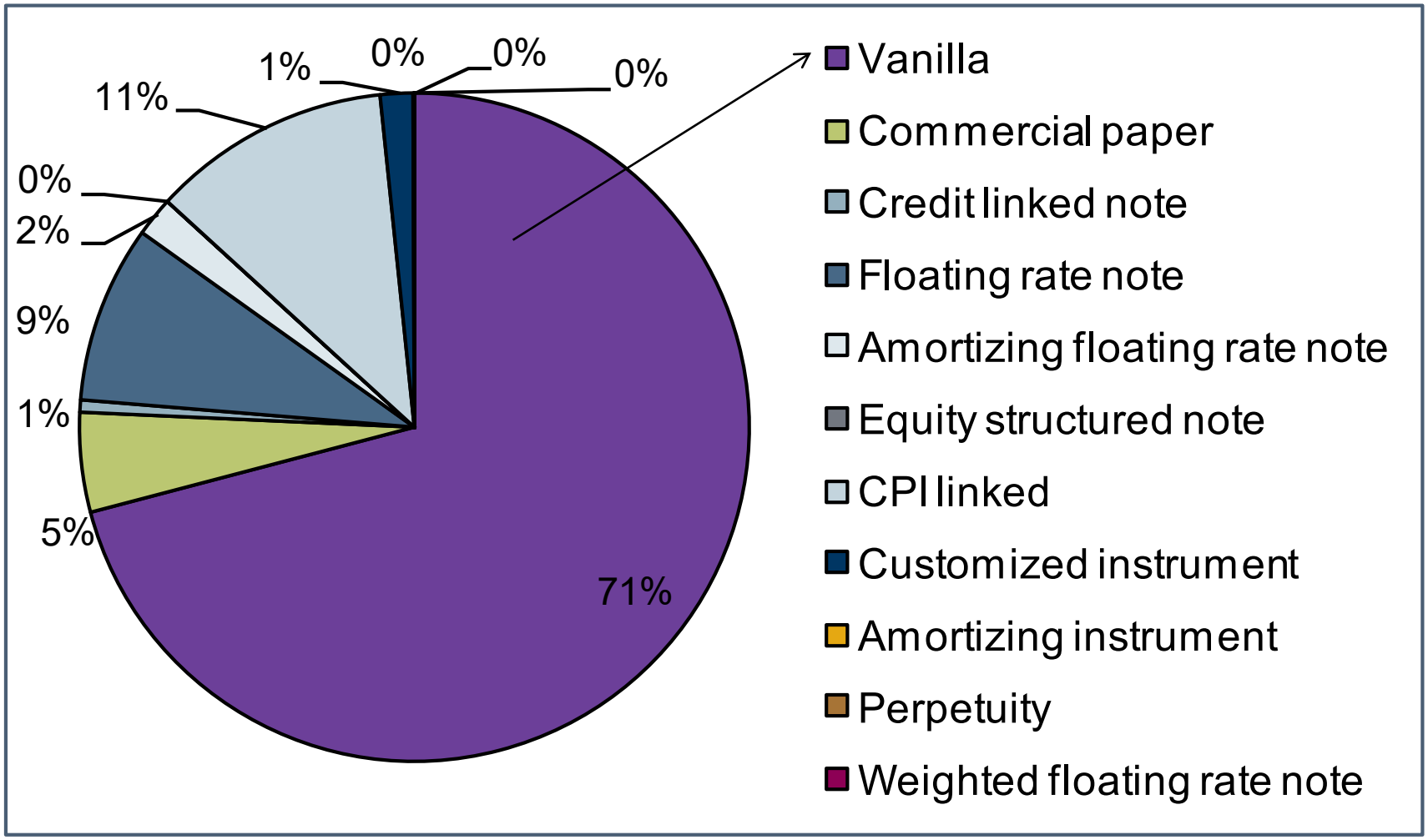
DEPARTMENT OF ECONOMICS

Types of Government issued Bonds

- Fixed Rate (Plain Vanilla) bonds: Such as the R209, the **Coupon** payments & principal repayment are **fixed**
- Zero Coupon Bonds: **No coupons** are paid – implying that the investor is compensated for by a sufficiently large discount on principal when bought. [Z109]
- Inflation-Linked bonds: The Coupon payments of these bonds are adjusted according to the **headline inflation** level. [R197]
- Variable Rate Bonds: Coupon rates vary with some pre-specified benchmark rate → floating rate tracking e.g. Jibar, Repo, … [R205]
- Perpetual Bonds: Pay Coupons indefinitely – no principal repayment ($M \rightarrow \infty$)
- Retail Savings bonds: Discussed separately later.

For a more detailed breakdown of all types, visit: http://www.bondexchange.co.za/types

Breakdown of Bond issuance in SA by Type



Source: JSE

BESA

- As with shares after an IPO, Bonds can be traded after its primary issue on a secondary market – until its maturity.
- Unlike the OTC MMIs in SA, the bond-market has a formalized trading platform BESA (Bond Exchange SA).
- **Traders then consider a fair YTM and price bonds accordingly to achieve a desired YTM**
- BESA has been a subsidiary of the JSE since 2009, which has greatly increased the efficiency, liquidity and transparency of bond trading on the secondary market in SA. For 2011 the stats speak for themselves:
  - BESA is regarded as one of the most liquid bond exchanges in the world.
- The BESA is, however, dominated by government bond issuance, boasting a relatively small **corporate** bond market

Capital Loss possible with bonds?

- Bonds can incur capital losses / gains, similar to that achieved by holding equities.
  - How is this possible though?
- If a bond is held to maturity – it does not waiver in value, as the holder knows up front what he would earn.
- How then is it possible to incur a capital loss?
- As these instruments are often held as capital by large institutions (particularly banks) – if the market yields change, so does the value of the bonds held… and due to mark-to-market accounting practices, the value of the bond security needs to be adjusted.

Capital Loss possible with bonds?

- Thus suppose a bond is bought with a YTM of 8% p.a. today.
- Suppose in 1 year, the prevailing YTM in the market is 8.5%.
- As you are holding a lower yielding instrument (remember, the coupon rate and principal value remains fixed for the bond you hold), the price thereof will have to be adjusted downward in order to compensate the buyer for the lower coupons and thus bring the bond to the prevailing YTM.

Capital Loss possible with bonds?

- This way, if yields in the market rise, bonds held on the portfolio of e.g. banks become worth less, and a capital loss must be realized (if the asset is held to maturity or not is irrelevant)
- Crucial in calculating the exposure to interest rate movements is by looking at the weighted average **duration** of bond holdings. (**seeking to reduce duration if expectation is of future rate rises**) **– thus bond portfolio management is crucial in ensuring capital protection even in FI portfolios!**

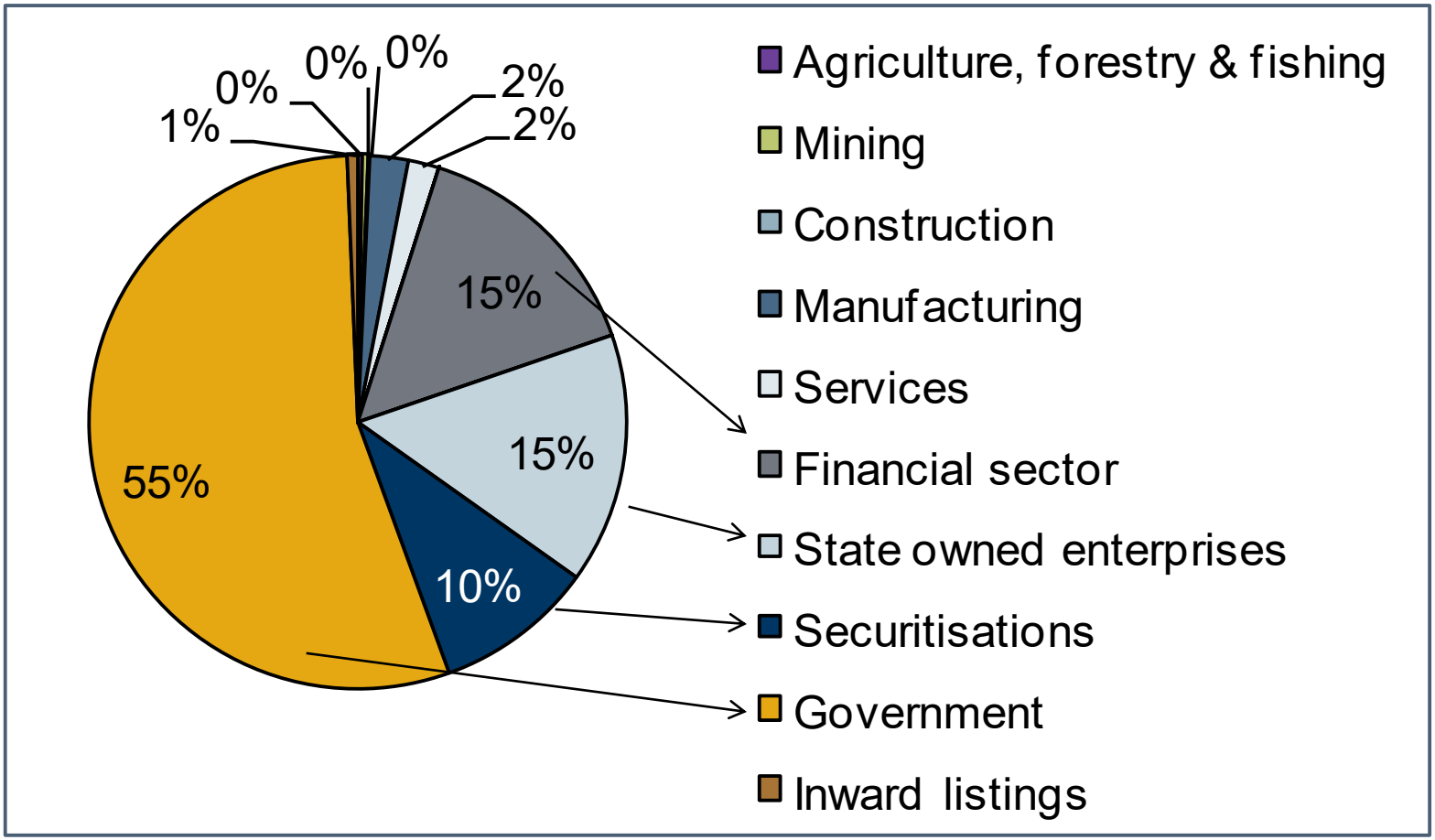
UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

BONDS in SA

Department of Economics

DEPARTMENT OF ECONOMICS

Breakdown of Bond issuance by sector



Source: JSE

Types of bonds

*MTM = Mark-to-Market YTM

Bond Code	Maturity	Type	Coupon	AIP	*M-T-M YTM	Modified Duration	Delta	Convexity
R206	2014/01/15	Vanilla	7.50	102.1	5.195	0.2967	-0.303	0. 176
R157	2015/09/15 (MT Bond)	Vanilla	13.5	114.2	5.940	1.7459	-1.995	4.0562
R204	2018/12/21	Vanilla	8.00	106.8	6.905	4.1700	-4.456	21.704
R186	2026/03/31 (LT Bond)	Vanilla	10.5	124	7.880	7.5029	-1.087	80.5057
R225C (comp bond: R201)	2014/03/15	Zero-C	0	97.73	5.000	0.4545	-0.442	0.4096
R229C (comp bond: R157)	2016/03/15	Zero-C	0	97.7	5.76	2.39	-2.084	6.9

The R186 bond is often referred to as the **benchmark rate** – as it is the debt instrument with the highest level of liquidity (most traded bond)

Local sovereign bonds

South Africa | Settings

Historical Data Range: 1 Year

	Security		Price	Yield	Chg	Yield	#SDΔ/day	Low	Range (Avg / Now)	High	Avg	+/-	#SD	RSI
1)	SA (Local)													
10)	2032	10Y	83.585	11.088	+11.6		0.2	9.454		11.505	10.213	+87.5	+1.9	59.4
11)	2040	15Y	80.644	11.612	+11.2		0.3	10.067		11.941	10.811	+80.1	+2.0	60.7
12)	2044	20Y	77.649	11.594	+9.9		0.3	10.211		12.034	10.914	+68.0	+1.8	59.7
3)	Inflation													
14)	SA B/E 10YR			7.060	+11.7		0.3	5.827		7.583	6.489	+57.1	+1.4	53.6
15)	R202	10Y	92.737	4.272	-0.2		0.0	3.621		4.354	3.936	+33.6	+2.0	70.1
16)	2038	15Y	76.690	4.348	+0.0		0.0	3.698		4.370	4.029	+31.8	+1.8	70.2
4)	CDS Spread													
18)	SOAF CDS USD SR 5Y			305.0	+5.7		0.1	191.1		380.9	242.9	+62.1	+1.5	55.7

…get this by typing SOVM ZA <GO> on Bloomberg…

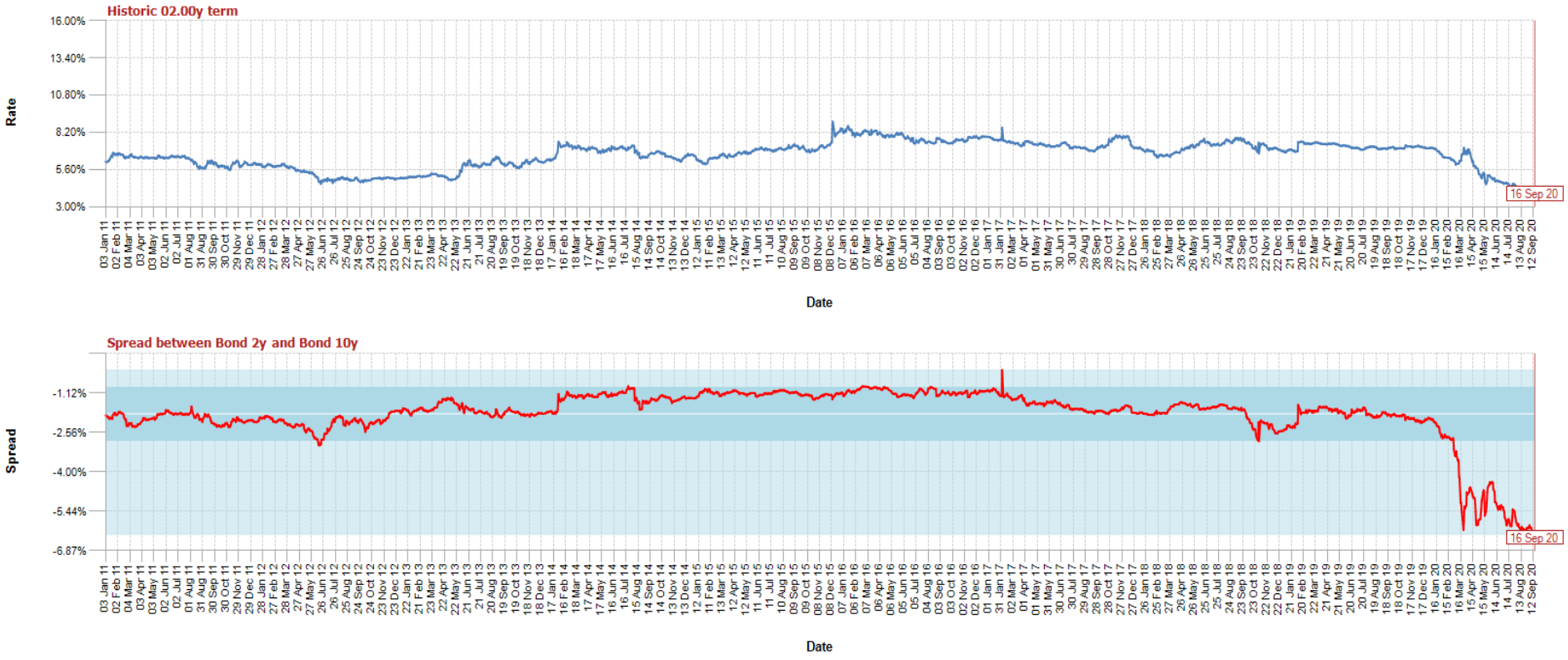
M-T-M YTM

- The **MTM** on the previous slide is the Mark-to-Market YTM that is calculated by BESA on a daily basis – considering the last trade of the bond.
- The M-T-M YTM is quoted in %pa nacs (nominal annual compounded semi-annually)

The 2018 and 2036 maturing bond spread over the last five years: SA

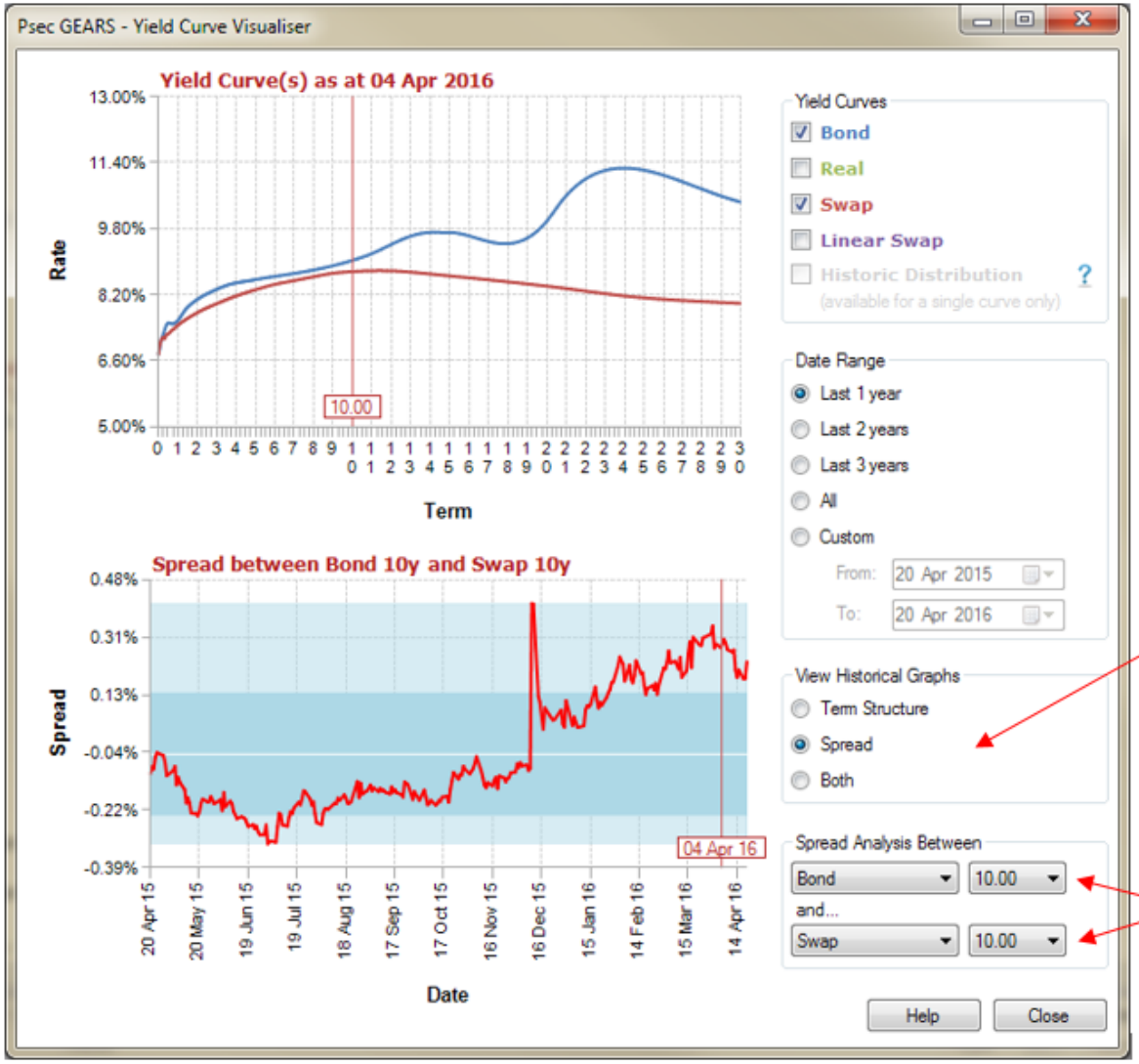
Below is the spread between the 2Y and 10Y maturing bonds for the last ten years. This can be seen as an indication of the yield spread at the **long end** of the yield curve, which is used as a proxy for long term inflation / macro stability outlook.

What does a widening gap imply?



Yield Curve Analysis

- How practitioners look at Yield Curves



An example of simple spread analysis:

The bottom graph illustrates the historic spread over the last year between the Bond and Swap curve at the 10 year term overlaid on the distribution over the same period.

Choose between viewing the charts of the historic term structure, spread or both.

Please note that on some lower screen resolutions viewing both charts might be not be recommended.

Select the required curve and term pair over which to calculate the historical spread and distribution

How can you own a bond?

- Individual investors typically hold bonds in the form of indices – which are effectively a collection of investors who invest in managed funds that are mandated to hold bonds. These include:
- **GOVI**: Most liquid Government Bonds
- **ALBI** (All bonds index): Most liquid of all bonds
- **OTHI**: Non-sovereign bond index.

Total Return Indices

Index	Today	Yield	Previous	Yield
ALBI	*420.992*	*7.139*	*419.648*	*7.187*
GOVI	*421.374*	*6.926*	*420.073*	*6.975*
OTHI	*418.348*	*7.987*	*416.769*	*8.033*

Investors can also invest in debt instruments via **RSA Retail Savings bonds**.

Started in 2003, largely as a means of facilitating

It's offered as a Fixed Rate or CPI-Linked RSA retail bond.

Maturities vary from 2, 3, 5 & 10 years.

These instruments are not traded on the BESA and are normally held to maturity.

FIXED RATES	INFLATION LINKED RATES (2012)	INFLATION LINKED RATES (2013)	INFLATION LINKED RATES (2014)
2 Year Fixed Rate	6.00%	6.50%	7.250%
3 Year Fixed Rate	6.50%	7.00%	7.75%
5 Year Fixed Rate	7.00%	7.50%	8.25%
3 Year Inflation	1.00%	1.00%	1.00%
5 Year Inflation	1.25%	1.25%	1.25%
10 Year Inflation	2.25%	2.25%	2.25%

US Bond Fund ETFs

- One of the most famous Bond ETFs tracked globally is the iShares TLT ETF – which tracks the investment result of an index composed long term US treasury bonds, with remaining maturities greater than 20 years.
- Due to the long maturity and subsequently large Duration (a duration of roughly 17%) – this fund is particularly exposed to interest rate risk. In 2013, with the Fed's taper tantrum episode, the fund lost a lot of ground.
  - From our earlier calculations – if $D^* = 17$, a 1% interest rate change leads to a near 17% move in the price.
  - Considering that the FED started their taper-talks in May 2013→ this impact on the prices (values) of the longer term bonds in the TLT fund was large (the 10year bond rate, e.g., moved more than 100 bps since May).

TLT performance: Last 5 Years

- Bond funds do move up and down too – not unlike equity funds….

Source: Bloomberg

Summarizing bonds as a financial asset

Pros of holding debt instruments

- The most obvious benefit to holding a debt instrument is that investors know what they get (if held to maturity).
  - For this reason, FI securities (such as MMIs and Bonds) are considered as the less risky part of an investor's portfolio.
  - Risks to holding a debt instrument to maturity include: **Default risk** (although for government bonds this is normally very low), **inflation risk** (eroding the value of the fixed return from holding a non-FRN bond) & **Currency risk** (depreciation in the currency in which the bond is held).
  - Now as buyers of bonds often do not hold FIs to maturity, holding debt instruments as a short term part of your portfolio can be risky i.t.o. price movements:
  - Here factors other than the integrity and ultimate sovereignty of the bond issuer then becomes important, as holding a bond with the hope of selling it adds other risks, such as: **interest-rate** risks, **economic instability** risk, **Liquidity** risk, etc.

Investor choices…

- We have now looked at both the **Share market** and the **Debt market** as conduits for investors to transfer their current resources to the future.

- As seen – the share market traditionally provides investors with higher and more volatile returns (infinite upside)… While the Debt market allows for safer investments, but offer limited upside returns in return.

- Ideally, investors would now like to combine the two in a portfolio that is sufficiently diversified among shares and debt instruments.

- Investors can now choose to either invest in actively managed funds (where fund managers use their discretion as to investing between these different classes) or passive strategies (buy and hold approach).

Now you can understand the news better

- **Source:**

- "At 15:44 local time, the benchmark R157 bond was trading at 5.410% from its best level of 5.360% and 5.420% at Tuesday's close. The R207 was bid at 6.450% and offered at 6.430% from Tuesday's close of 6.490%, and the R186 was trading at 7.470% from 7.510% at its previous close"

- **Source:**
- Government bonds were firmer, with the yield on the 2026 paper declining 5 basis points to 7.855% and that on the 2015 instrument falling 1 basis point to 5.91%.

  South Africa will auction R2.35bn of 2025, 2031 and 2037 bonds at 11:00.

UNIVERSITEIT•STELLENBOSCH•UNIVERSITY
jou kennisvennoot • your knowledge partner

The End

Department of Economics

DEPARTMENT OF ECONOMICS