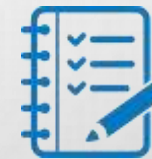


A5. BOND MARKETS



- WHY DO CAPITAL MARKETS EXIST?
- HOW DO CAPITAL MARKETS WORK?
- WHAT IS TRADED THERE?
- WHAT ARE THE FEATURES OF BOND MARKETS?

CAPITAL MARKETS

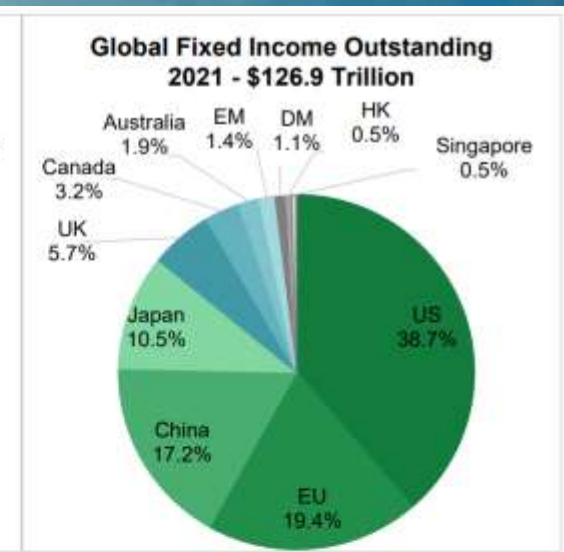
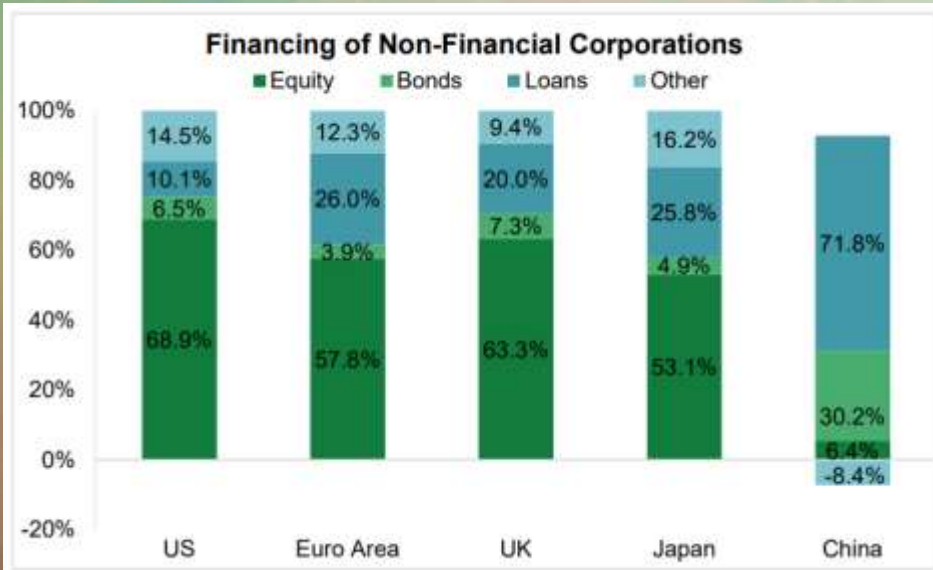
Main features:

- **Long-term** investment
- **Interest-rate risk reduction** for borrowers (compared to short-term changes in cost of capital)
- **Higher cost of borrowing: credit risk and liquidity premiums**
- **Significantly active markets**, but less than money markets
- **Very diverse and competitive**, but not for all securities/firms

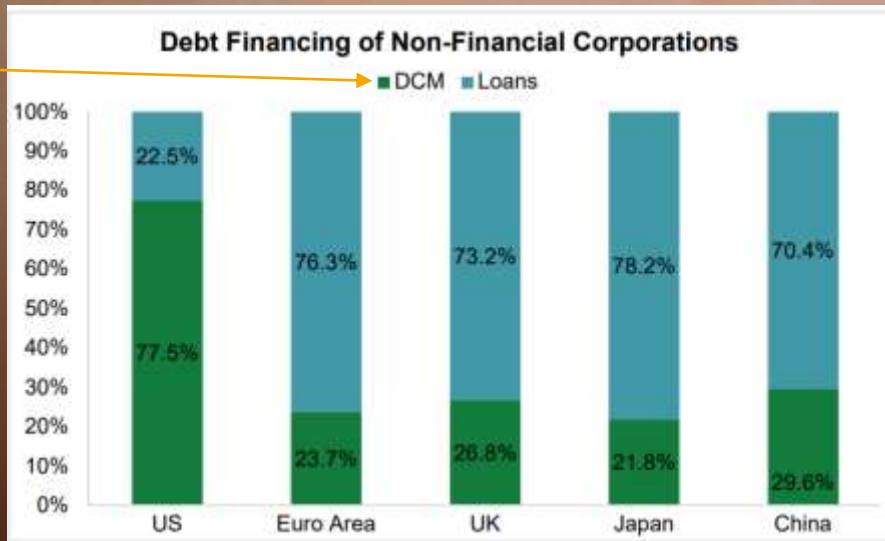


- **Issuers of bonds:** governments and corporations
- **Issuers of stocks:** corporations
- **Lenders:**
 - households
 - financial intermediaries
 - corporations (f.i. groups)
 - governments (f.i. “strategic” interests)





Debt
Capital
Markets



EXAMPLES

Debt-to-GDP ratio dynamics

In per cent

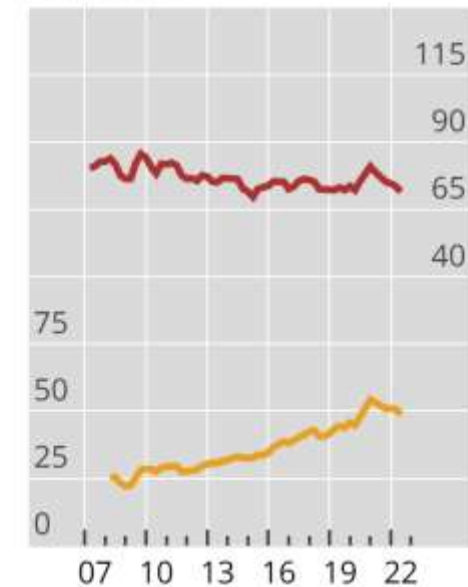
Government



Non-financial corporations



Households



Total non-financial sector



— Emerging market economies (lhs)¹

— Advanced economies (rhs)²

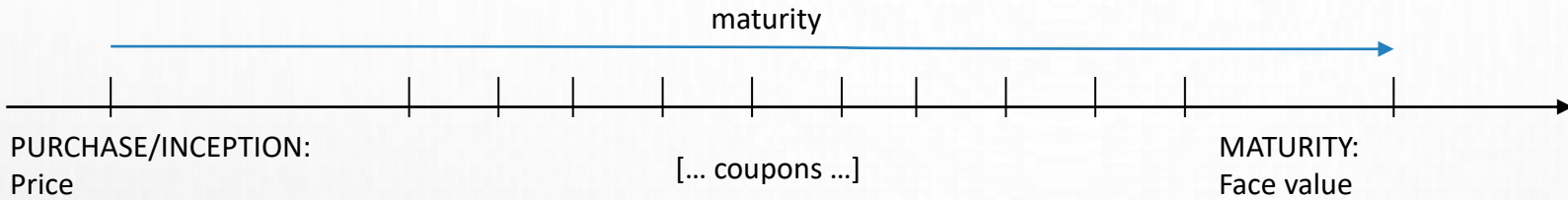
¹ Weighted average across Argentina, Brazil, Chile, China, Colombia, Czechia, Hong Kong SAR, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Poland, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Turkey. ² Weighted average across Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States.

Sources: National data; BIS total credit statistics; BIS.

EXAMPLES

FIXED INCOME: FEATURES

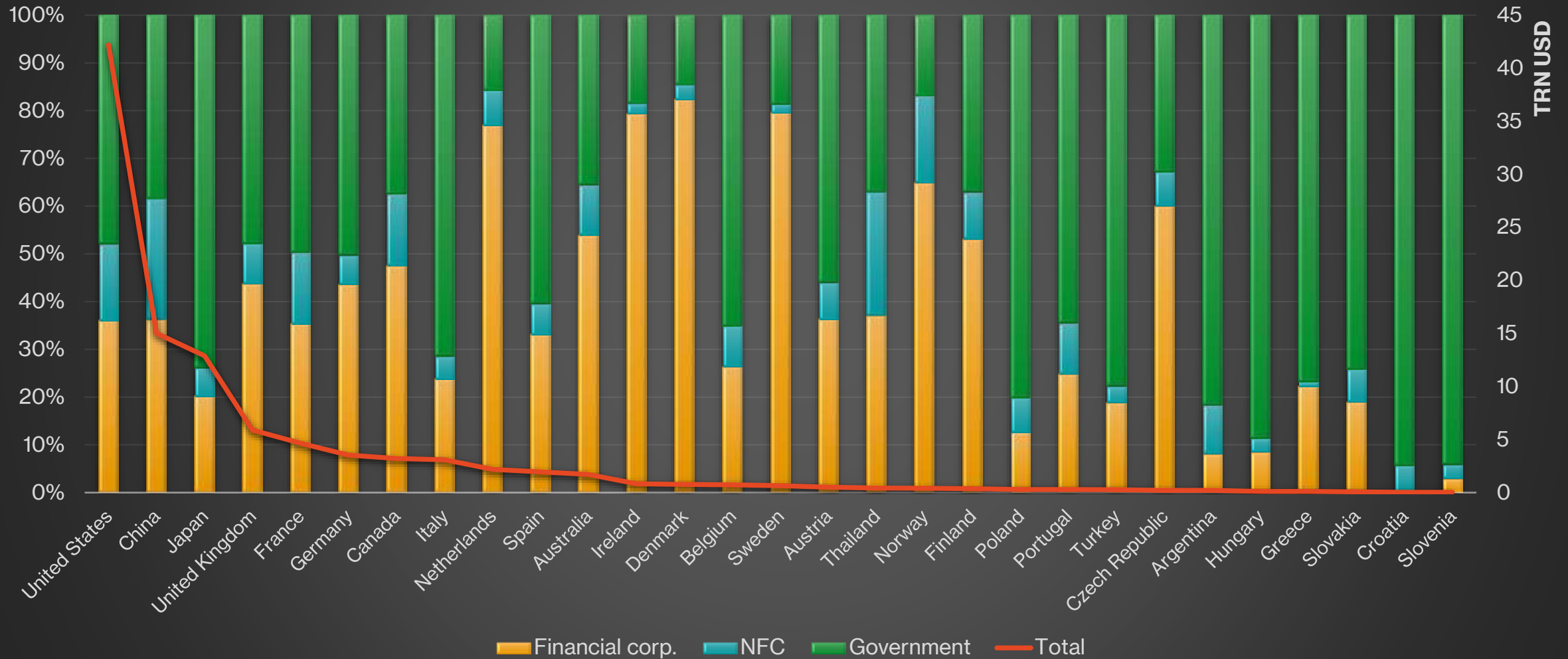
Bond features:

- 
 - Typically, fixed or variable (f.i. Euribor 1m+spread)
 - Frequently with *caps* and *floors*
 - Variations: *step-up/down* (coupons grow/shrink over time)
 - Other: linked (f.i. on currencies) or structured (f.i. *reverse floater*, ...)
- Specified maturity dates for principal (except perpetuity) and interests (except ZC)
- If payments are missed, bondholders have a claim over debtor's assets (claim level may vary widely)



See some statistics at <http://stats.bis.org/statx/srs/table/c1>

Outstanding debt – selected countries (Q12020)



EXAMPLES

FIXED INCOME: INSTRUMENTS

Government bonds

- Notes/bills/treasuries (1 y-10y) and bonds (10y-30⁺y) – names vary widely across countries
- Lower credit risk premiums
- Other usual risks: interest-rate, inflation, liquidity and currency risks
- ZC (from 3 months to 2 years) or coupon bonds
- Increasing amount of alternative structures:
 - Usually fixed IR, but variable are possible
 - Linked/structured to inflation, or longevity
- Coupons usually paid annually or semi-annually
- Other government-related entities might be allowed to issue own bonds



FIXED INCOME: INSTRUMENTS

Corporate bonds (1/2)

- Features embrace all potential variations
- Frequently involve *covenants* (on dividends, on additional debt, on specific company measures, on M&A, ...) to reduce moral hazard
- Several are callable:
 - may be redeemed before maturity, after a waiting period at par or higher
 - can reduce future costs of falling IR
 - also, to fulfill sinking bonds' requirements (proportionally and periodically reimburse an issue)
 - additionally, to avoid restrictive covenants
 - finally, to be flexible in altering companies' capital structure
- Some encompass collateral, mentioned in the bonds' indenture
- Involve various degrees of default risk



FIXED INCOME: INSTRUMENTS

Corporate bonds (2/2)

- some are convertible into common stock:
 - at a specific price, usually anticipating a rise in its level to be exercised
 - avoids negative signaling of overvalued equity of a direct issue of stocks
 - usually means lower IR
- secured (mortgage or other tangibles – *asset backed securities* or ABS) – with higher priority in case of default Vs. unsecured (called debentures) – with lower priority and higher IR
- some issues can be tranching in senior/mezzanine/junior tranches, with decreasing subordination of claims at default
- Investment grade (at or above Moody's Baa or S&P's BBB) Vs. high-yields bonds



M. Milken:

- inventor of «junk» bonds in late 70s
- earning more than 1 bln USD by mid 80s
- paid with jailtime and 1.1 bln USD in fines for several misbehaviour indictments

Moody's		S&P		Fitch	
Long	Short	Long	Short	Long	Short
Aaa		AAA		AAA	
Aa1		AA+	A-1	AA+	F1+
Aa2	P-1	AA		AA	
Aa3		AA-		AA-	
A1		A+	A-1	A+	F1
A2		A		A	
A3		A-		A-	
Baa1	P-2	BBB+	A-2	BBB+	F2
Baa2		BBB		BBB	
Baa3	P-3	BBB-	A-3	BBB-	F3
Ba1		BB+		BB+	
Ba2		BB		BB	
Ba3		BB-	B	BB-	B
B1		B+		B+	
B2		B		B	
B3		B-		B-	
Caa1	Not prime	CCC+			
Caa2		CCC			
Caa3		CCC-	C	CCC	C
Ca		CC			
		C			
C				DDD	
/		D	/	DD	/
				D	

«Investment grade»

«High yield»
«Speculative»
«Junk»

Default



EXAMPLES

FINANCIAL GUARANTEES

A form of protection:

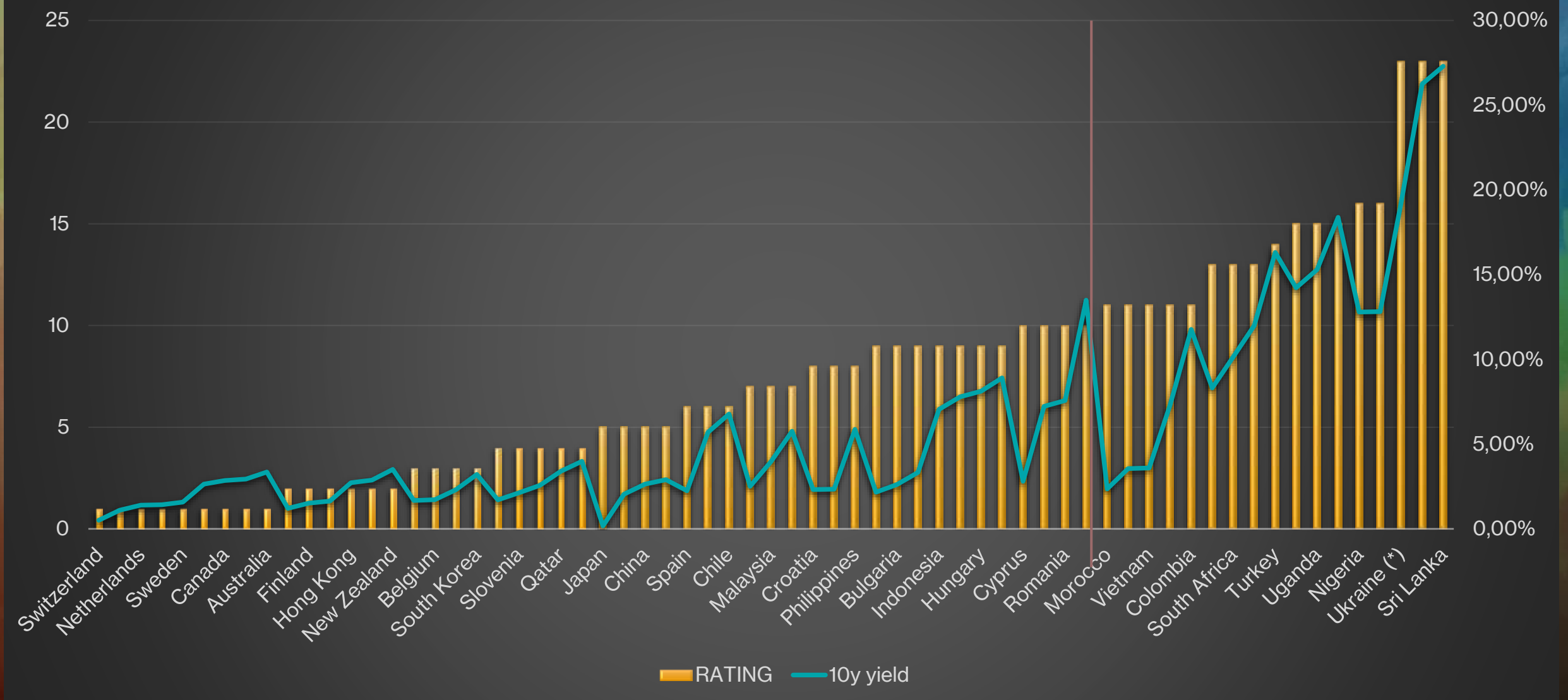
Internal:

- purchased by weaker issuers to increase market's appetite for their bonds
- issued by intermediaries (especially banks and insurers, but also others)
- creditworthiness is transferred from guarantor to issuer

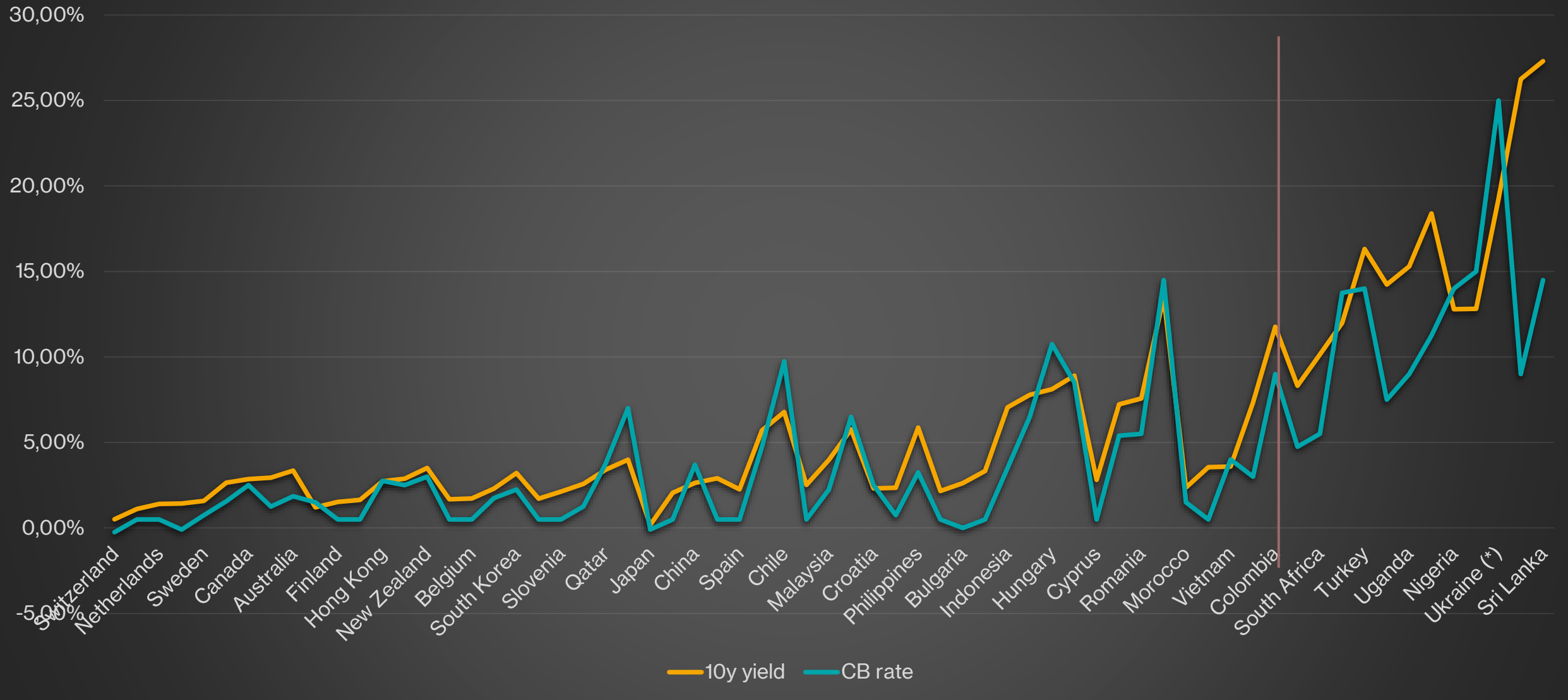
External:

- bondholders can purchase a guarantee over a specified issuer
- some insurance policies and guarantees specifically address this issue
- some of these can be traded independently from the underlying bond (f.i. credit default swaps – CDS)

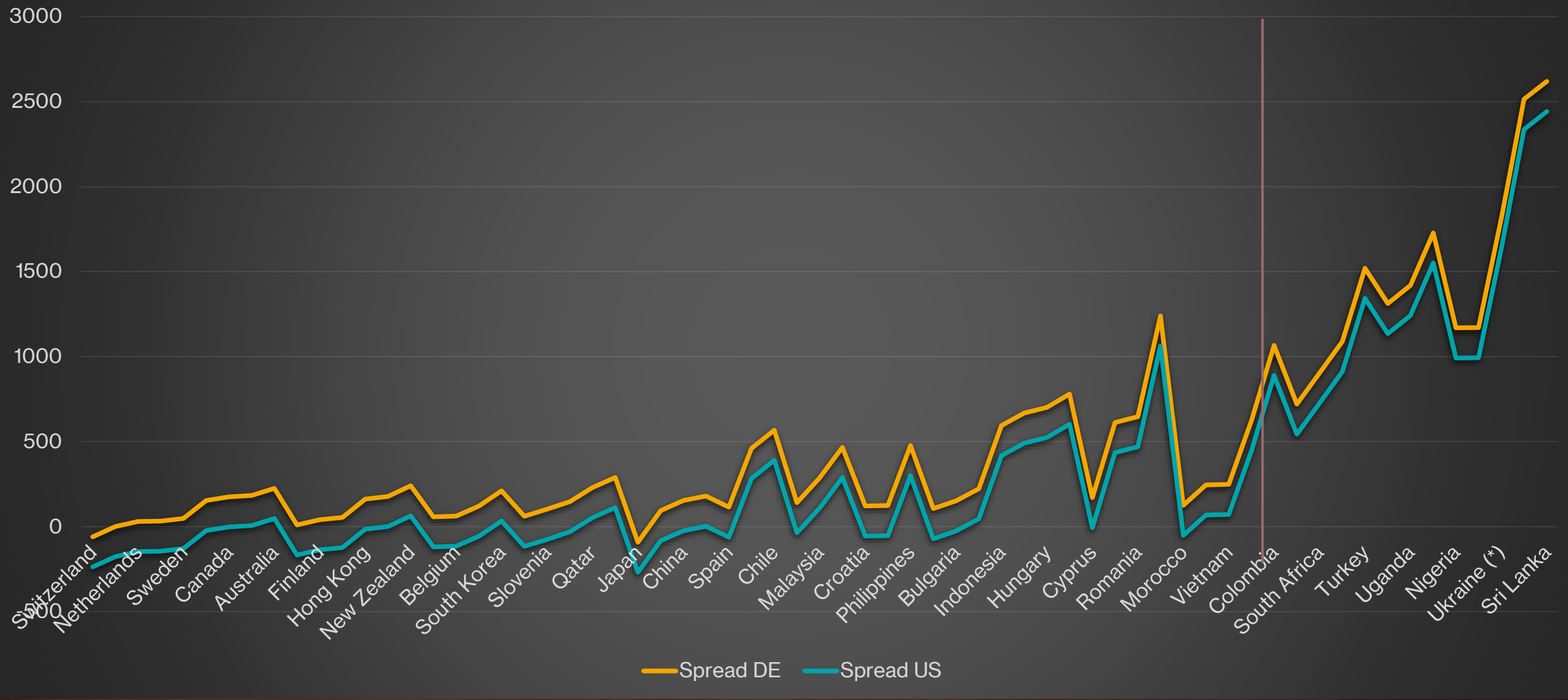




EXAMPLES



EXAMPLES



EXAMPLES

Consider the following three bonds, all with face value of 1,000 and annual coupons:

	Maturity	Coupon
Bond1	5y	5%
Bond2	10y	7%
Bond3	15y	9%

- What is their current price if required YTM equals 8% or 10% for all three?
- What is their current price if required YTM equals 9% for 5y, 11% for 10y and 13% for 15y (i.e. considering liquidity premiums)?

a) Calculate the present value of future cash flows under 8% and 10% YTM

$$PV_{h,k} = \sum_{t=1}^{N_h} \frac{1,000 \cdot i_h}{(1 + YTM_k)^t} + \frac{1,000}{(1 + YTM_k)^{N_h}}$$

H / K	8%	10%
1	880.22	810.46
2	932.90	815.66
3	1,085.59	923.94

b) Calculate the PV under different YTM:

H / K	YTM	PV
1	9%	844.41
2	11%	764.43
3	13%	741.50

EXAMPLES

A bank invests in a portfolio with the following assets (assume that market IR are 4,5%):

- 1) 1 mln € (face value) in a 10 year government bond with a 6% coupon paid annually
- 2) 0.5 mln € (face value) in a zero-coupon bond due in 5 years
- 3) 1.5 mln € in a mutual fund of bonds with a 6.5 years duration

Calculate the price change of this portfolio if market IR rise to 5,5%

a) Calculate prices and durations:

$$DUR_1 = \left(\sum_{t=1}^{10} t \cdot \frac{60,000}{1.045^t} + 10 \cdot \frac{1,000,000}{1.045^{10}} \right) / \left(\sum_{t=1}^{10} \frac{60,000}{1.045^t} + \frac{1,000,000}{1.045^{10}} \right) = 7.94$$

$$DUR_2 = 5$$

$$DUR_3 = 6.5$$

$$P_1 = \sum_{t=1}^{10} \frac{60,000}{1.045^t} + \frac{1,000,000}{1.045^{10}} = 1,118,691.77$$

$$P_2 = \frac{500,000}{1.045^5} = 401,225.52$$

$$P_3 = 1,500,000$$

$$DUR_p = \frac{7.94 \cdot 1,118,691.77 + 5 \cdot 401,225.52 + 6.5 \cdot 1,500,000}{1,118,691.77 + 401,225.52 + 1,500,000} = 6.83$$

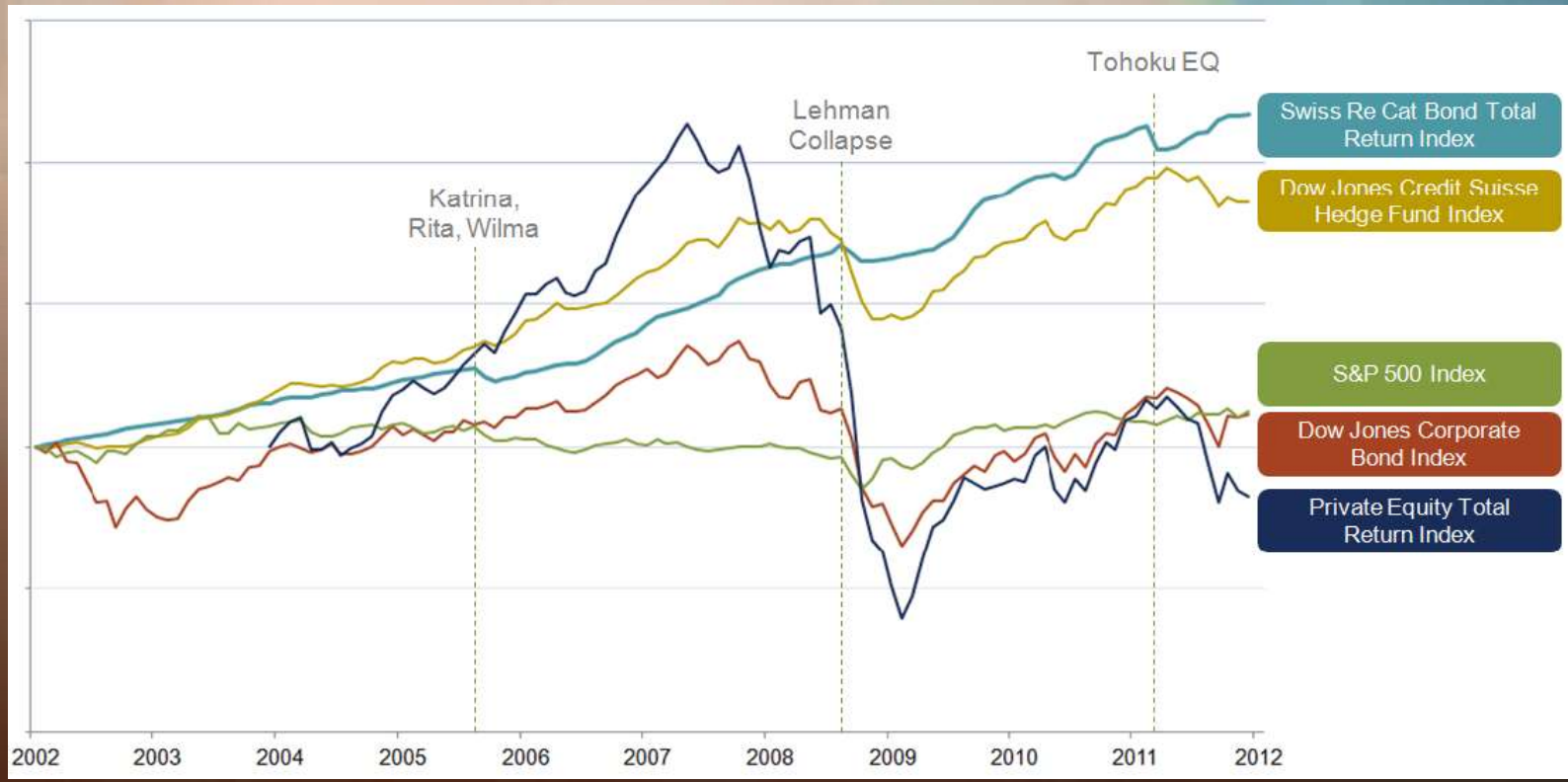
b) Calculate the change in portfolio's value:

$$\% \Delta P \approx -6.83 \cdot \frac{1\%}{1 + 4.5\%} = -6.54\%$$

EXAMPLES

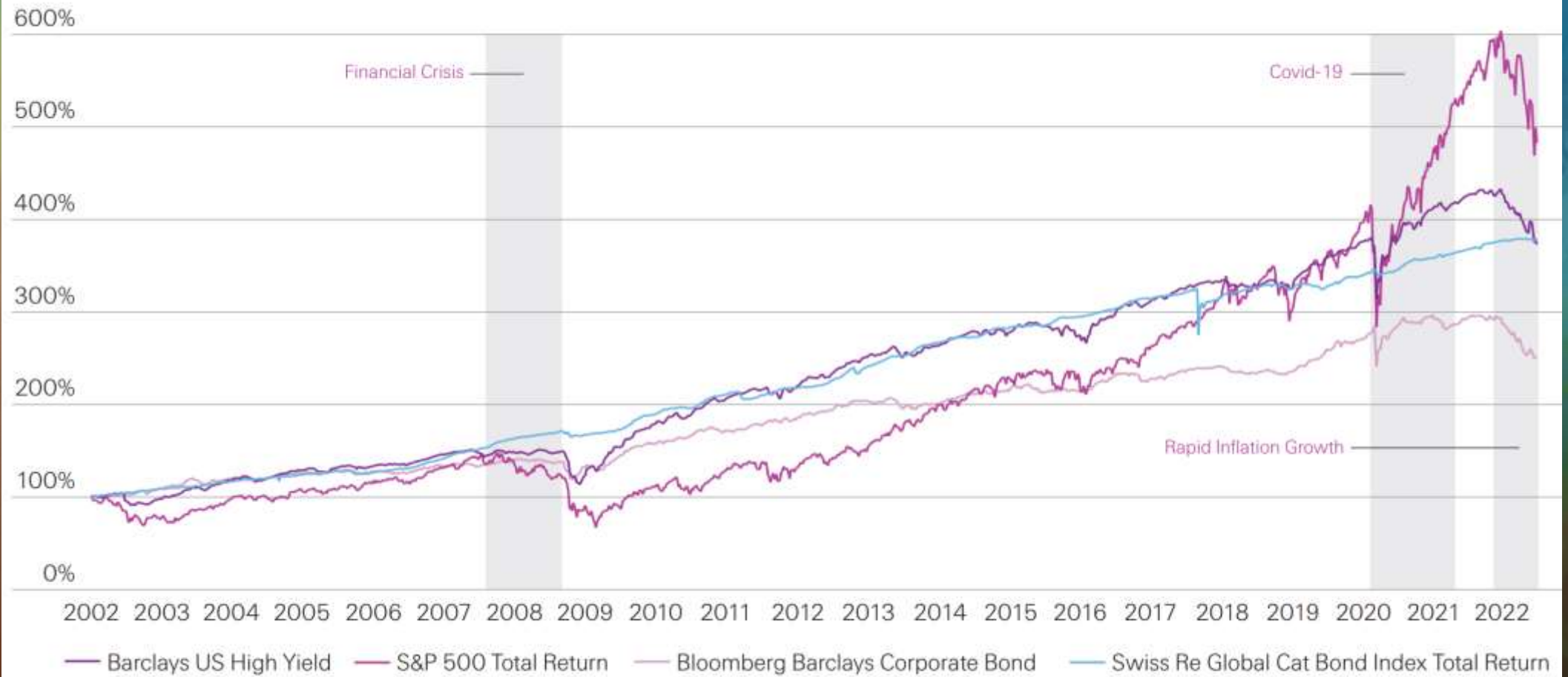
'Cat bonds' are interesting. Most part pays a coupon until a catastrophe or similar trigger event occurs, after which the coupon or even the principal are reduced or waived. Currently they total an outstanding of nearly 40 bln \$.

- Who could be interested in selling these securities?
- Who could be interested in buying these securities?
- What would be the consequence on cat-bonds, in our demand/supply framework, of the recent growth in yields of traditional bonds?



EXAMPLES

Swiss Re Global Cat Bond Total Return Index (SRGLTTR) vs other relative benchmarks



Source: Swiss Re Capital Markets and Bloomberg LP, as of June 30, 2022

EXAMPLES

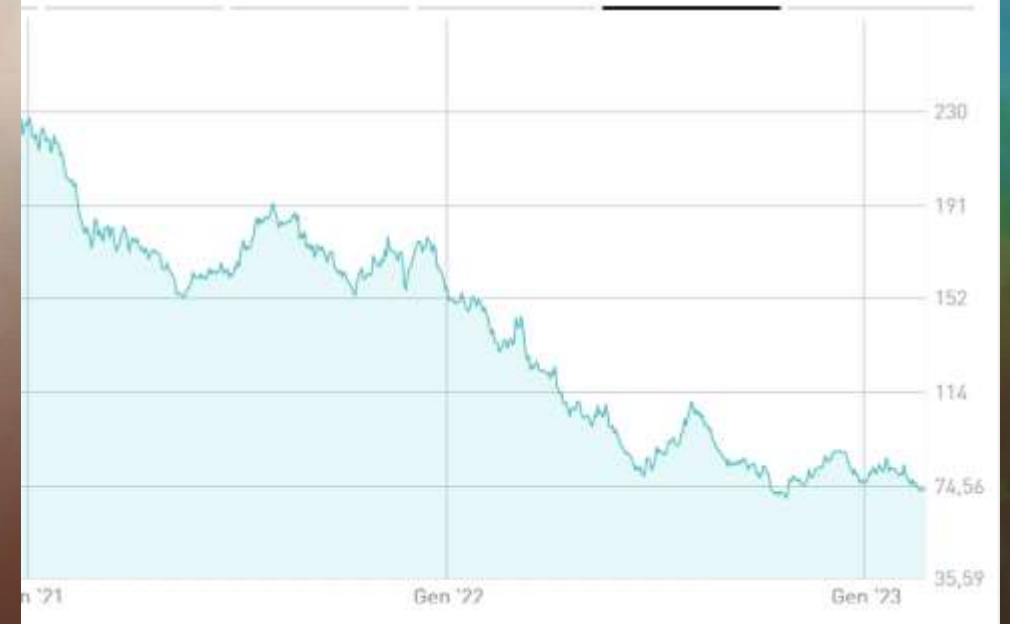
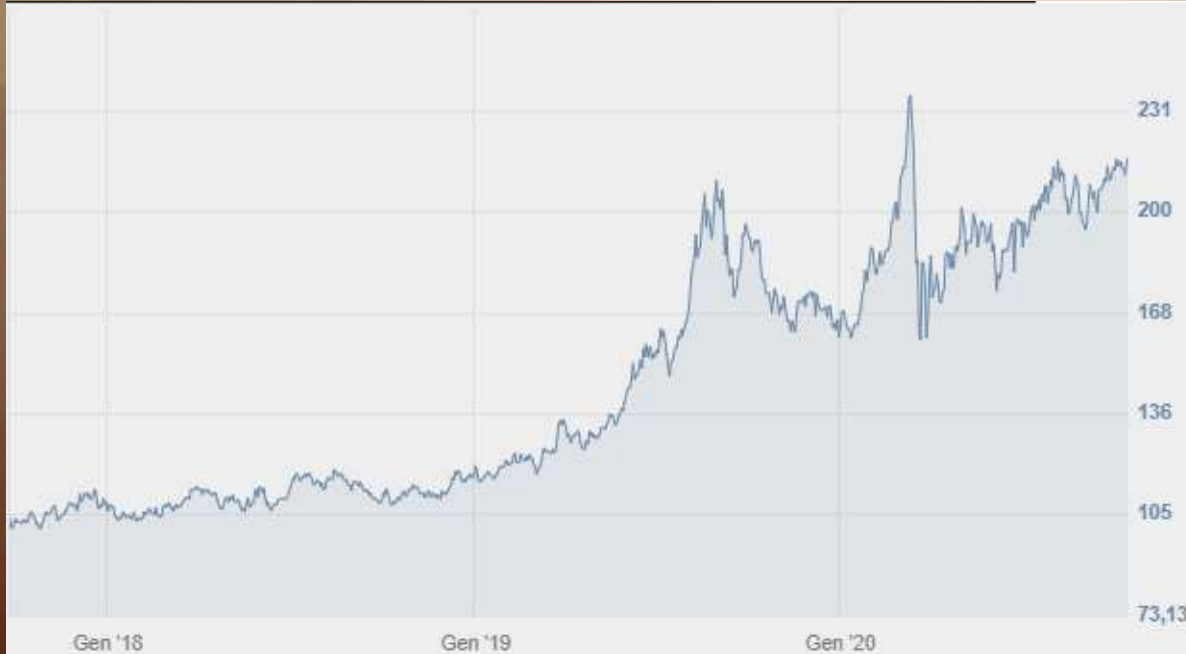
Would you buy a government bond rated AA+ with maturity in 09.2117?

MARKETS

A 100-Year Bond for a 99-Year-Old Country

Austria issued the first public, centurylong bond by a eurozone government

- D/S = 3X
- IR: 2.1%



EXAMPLES