Risk and Cost of Equity: The role of the marginal investor

- Not all risk counts: While the notion that the cost of equity should be higher for riskier investments and lower for safer investments is intuitive, what risk should be built into the cost of equity is the question.

- Risk through whose eyes? While risk is usually defined in terms of the variance of actual returns around an expected return, risk and return models in finance assume that the risk that should be rewarded (and thus built into the discount rate) in valuation should be the risk perceived by the marginal investor in the investment

- The diversification effect: Most risk and return models in finance also assume that the marginal investor is well diversified, and that the only risk that he or she perceives in an investment is risk that cannot be diversified away (i.e, market or non-diversifiable risk). In effect, it is primarily economic, macro, continuous risk that should be incorporated into the cost of equity.

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The Cost of Equity: Competing " Market Risk" Models

Model	Expected Return	Inputs Needed
CAPM	$E(R) = Rf + \beta (R_m - R_f)$	Riskfree Rate
		Beta relative to market portfolio
		Market Risk Premium
APM	$E(R) = Rf + \Sigma\beta_j (R_j - R_f)$	Riskfree Rate; # of Factors;
		Betas relative to each factor
		Factor risk premiums
Multi factor	$E(R) = Rf + \Sigma\beta_j (R_j - R_f)$	Riskfree Rate; Macro factors
		Betas relative to macro factors
		Macro economic risk premiums
Proxy	$E(R) = a + \Sigma \beta_j Y_j$	Proxies
		Regression coefficients

Classic Risk & Return: Cost of Equity

- In the CAPM, the cost of equity:

    Cost of Equity = Riskfree Rate + Equity Beta * (Equity Risk Premium)

- In APM or Multi-factor models, you still need a risk free rate, as well as betas and risk premiums to go with each factor.

- To use any risk and return model, you need
    - A risk free rate as a base
    - A single equity risk premium (in the CAPM) or factor risk premiums, in the the multi-factor models
    - A beta (in the CAPM) or betas (in multi-factor models)

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Discount Rates I

The Riskfree Rate

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The Risk Free Rate: Laying the Foundations

- On a riskfree investment, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, then, it has to have
  - No default risk
  - No reinvestment risk
- It follows then that if asked to estimate a risk free rate:
  1. Time horizon matters: Thus, the riskfree rates in valuation will depend upon when the cash flow is expected to occur and will vary across time.
  2. Currencies matter: A risk free rate is currency-specific and can be very different for different currencies.
  3. Not all government securities are riskfree: Some governments face default risk and the rates on bonds issued by them will not be riskfree.

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Test 1: A riskfree rate in US dollars!

□ In valuation, we estimate cash flows forever (or at least for very long time periods). The right risk free rate to use in valuing a company in US dollars would be

   a. A three-month Treasury bill rate (4.42%)

   b. A ten-year Treasury bond rate (3.88%)

   c. A thirty-year Treasury bond rate (3.97%)

   d. A TIPs (inflation-indexed treasury) rate (1.53%)

   e. The highest of these numbers

   f. The lowest of these numbers

   g. Other (Specify)

What are we implicitly assuming about the US treasury when we use any of the treasury numbers?

Test 2: A Riskfree Rate in Euros?

Government Bond Rates: 10-year Euro bonds

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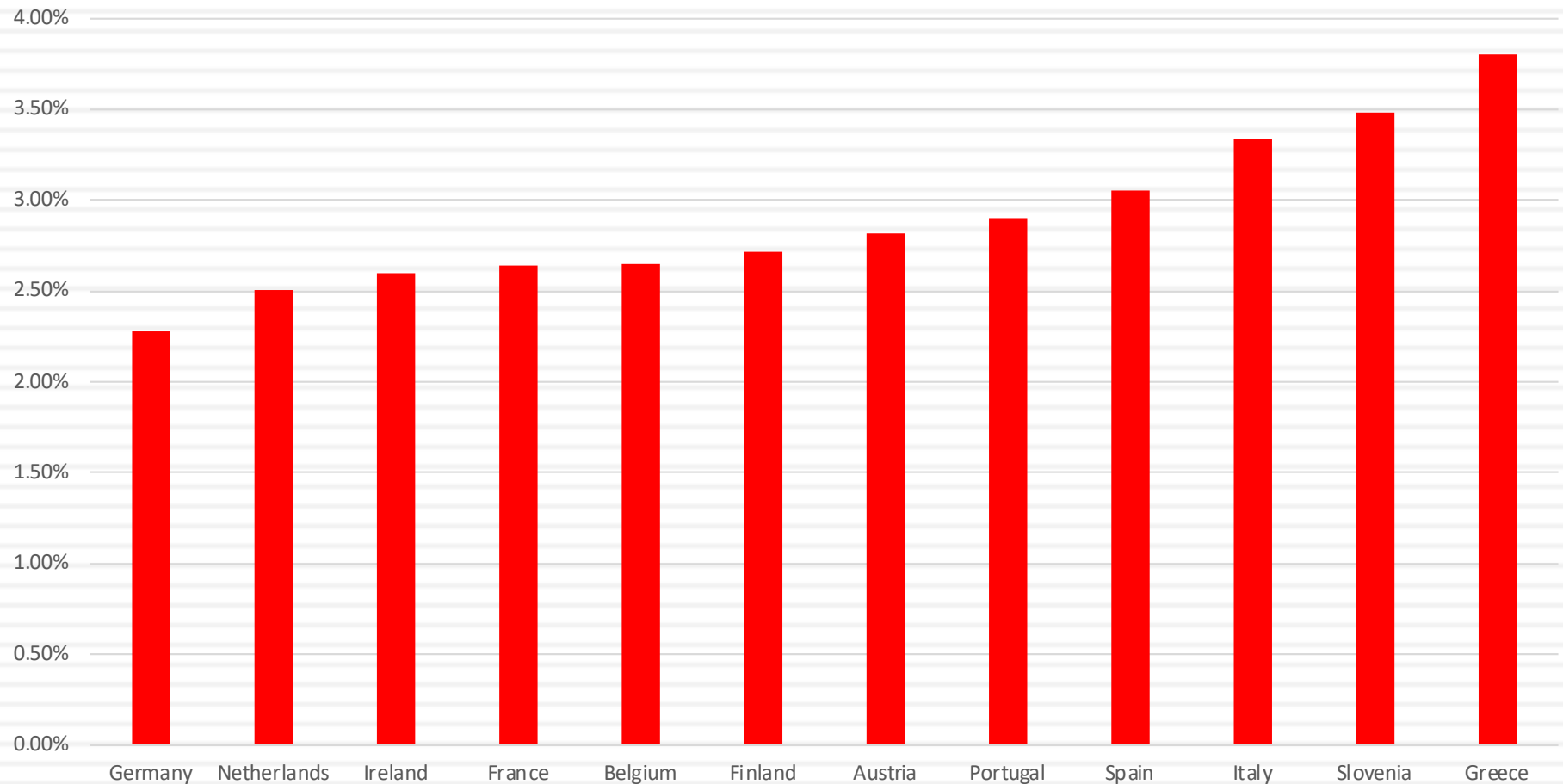
Test 3: A Riskfree Rate in Indian Rupees

- The Indian government had 10-year Rupee bonds outstanding, with a yield to maturity of about 7.34% on January 1, 2023.

- In January 2023, the Indian government had a local currency sovereign rating of Baa3. The typical default spread (over a default free rate) for Baa3 rated country bonds in early 2023 was 2.69%. The risk free rate in Indian Rupees is

  a. The yield to maturity on the 10-year bond (7.34%)

  b. The yield to maturity on the 10-year bond + Default spread (10.03%)

  c. The yield to maturity on the 10-year bond – Default spread (4.65%)

  d. None of the above

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Sovereign Default Spread: Three paths to the same destination...

- <u>Sovereign dollar or euro denominated bonds</u>: Find sovereign bonds denominated in US dollars, issued by an emerging sovereign.
  - Default spread = Emerging Govt Bond Rate (in US $) – US Treasury Bond rate with same maturity.
- <u>CDS spreads</u>: Obtain the traded value for a sovereign Credit Default Swap (CDS) for the emerging government.
  - Default spread = Sovereign CDS spread (with perhaps an adjustment for CDS market frictions).
- <u>Sovereign-rating based spread</u>: For countries which don't issue dollar denominated bonds or have a CDS spread, you have to use the average spread for other countries with the same sovereign rating.

Approach 1: Default spread from Government Bonds

Country	$ Bond Rate	Riskfree Rate	Default Spread
		$ Bonds	
Peru	5.66%	3.88%	1.78%
Brazil	6.15%	3.88%	2.27%
Colombia	5.75%	3.88%	1.87%
Poland	4.68%	3.88%	0.80%
Turkey	6.83%	3.88%	2.95%
Mexico	4.95%	3.88%	1.07%
Russia	10.38%	3.88%	6.50%
		Euro Bonds	
Bulgaria	3.50%	2.26%	1.24%

Approach 2: CDS Spreads – January 2023

Country	CDS on 1/23	CDS net of US	Country	CDS on 1/23	CDS net of US	Country	CDS on 1/23	CDS net of US
Abu Dhabi	0.78%	0.46%	Greece	1.97%	1.65%	Pakistan	NA	NA
Algeria	1.73%	1.41%	Guatamela	2.28%	1.96%	Panama	1.79%	1.47%
Angola	6.55%	6.23%	Hong Kong	0.71%	0.39%	Peru	1.94%	1.62%
Argentina	NA	NA	Hungary	2.43%	2.11%	Philippines	1.64%	1.32%
Australia	0.34%	0.02%	Iceland	0.73%	0.41%	Poland	1.45%	1.13%
Austria	0.24%	0.00%	India	1.67%	1.35%	Portugal	0.81%	0.49%
Bahrain	2.78%	2.46%	Indonesia	1.75%	1.43%	Qatar	0.79%	0.47%
Belgium	0.37%	0.05%	Iraq	4.69%	4.37%	Romania	3.17%	2.85%
Brazil	3.52%	3.20%	Ireland	0.43%	0.11%	Russia	NA	NA
Bulgaria	1.50%	1.18%	Israel	0.67%	0.35%	Rwanda	5.42%	5.10%
Cameroon	6.68%	6.36%	Italy	1.84%	1.52%	Saudi Arabia	0.96%	0.64%
Canada	0.36%	0.04%	Japan	0.31%	0.00%	Senegal	5.39%	5.07%
Chile	1.76%	1.44%	Kazakhstan	2.70%	2.38%	Serbia	2.93%	2.61%
China	1.11%	0.79%	Kenya	7.60%	7.28%	Slovakia	0.75%	0.43%
Colombia	3.65%	3.33%	Korea	0.68%	0.36%	Slovenia	1.00%	0.68%
Costa Rica	4.35%	4.03%	Kuwait	0.79%	0.47%	South Africa	3.51%	3.19%
Croatia	1.34%	1.02%	Latvia	1.37%	1.05%	Spain	0.82%	0.50%
Cyprus	1.33%	1.01%	Lebanon	NA	NA	Sri Lanka	NA	NA
Czech Republic	0.62%	0.30%	Lithuania	1.45%	1.13%	Sweden	0.26%	0.00%
Denmark	0.23%	0.00%	Malaysia	1.24%	0.92%	Switzerland	0.17%	0.00%
Dubai	1.26%	0.94%	Mexico	2.11%	1.79%	Thailand	0.87%	0.55%
Ecuador	16.93%	16.61%	Morocco	2.53%	2.21%	Tunisia	8.69%	8.37%
Egypt	8.01%	7.69%	Namibia	3.84%	3.52%	Turkey	5.30%	4.98%
El Salvador	27.46%	27.14%	Netherlands	0.26%	0.00%	Ukraine	NA	NA
Estonia	1.76%	1.44%	New Zealand	0.39%	0.07%	United Kingd	0.36%	0.04%
Ethiopia	28.33%	28.01%	Nicaragua	6.27%	5.95%	United States	0.32%	0.00%
Finland	0.34%	0.02%	Nigeria	8.52%	8.20%	Uruguay	1.43%	1.11%
France	0.42%	0.10%	Norway	0.28%	0.00%	Venezuela	NA	NA
Germany	0.28%	0.00%	Oman	2.37%	2.05%	Vietnam	2.07%	1.75%

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Approach 3: Typical Default Spreads: January 2022

S&P Sovereign Rating	Moody's Sovereign Rating	Default Spread
AAA	Aaa	0.00%
AA+	Aa1	0.49%
AA	Aa2	0.60%
AA-	Aa3	0.73%
A+	A1	0.86%
A	A2	1.04%
A-	A3	1.47%
BBB+	Baa1	1.96%
BBB	Baa2	2.33%
BBB-	Baa3	2.69%
BB+	Ba1	3.06%
BB	Ba2	3.68%
BB	Ba3	4.40%
B+	B1	5.51%
B	B2	6.73%
B-	B3	7.95%
CCC+	Caa1	9.17%
CCC	Caa2	11.02%
CCC-	Caa3	12.24%
CC+	Ca1	13.75%
CC	Ca2	14.68%
CC-	Ca3	15.25%
C+	C1	16.25%
C	C2	17.50%
C-	C3	19.00%

Getting to a risk free rate in Brazilian Reais on January 1, 2023

- The Brazilian government bond rate in nominal reais on January 1, 2023, was 12.76%. To get to a riskfree rate in nominal reais, we can use one of three approaches.
  - Approach 1: Government Bond spread
    - Default Spread = Brazil $ Bond Rate – US T.Bond Rate = 6.15% - 3.88% = 2.27%
    - Riskfree rate in $R = 12.76% - 2.27% = 10.49%
  - Approach 2: The CDS Spread
    - The CDS spread for Brazil, adjusted for the US CDS spread was 3.20%.
    - Riskfree rate in $R = 12.76% - 3.20% = 9.56%
  - Approach 3: The Rating based spread
    - Brazil has a Ba2 local currency rating from Moody's. The default spread for that rating is 2.56%
    - Riskfree rate in $R = 12.76% - 3.68% = 9.08%

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Test 4: A Real Riskfree Rate

- In some cases, you may want a riskfree rate in real terms (in real terms) rather than nominal terms.

- To get a real riskfree rate, you would like a security with no default risk and a guaranteed real return. Treasury indexed securities offer this combination.

- In January 2023, the yield on a 10-year indexed treasury bond was 1.53%. Which of the following statements would you subscribe to?
    a. This (1.53%) is the real riskfree rate to use, if you are valuing US companies in real terms.
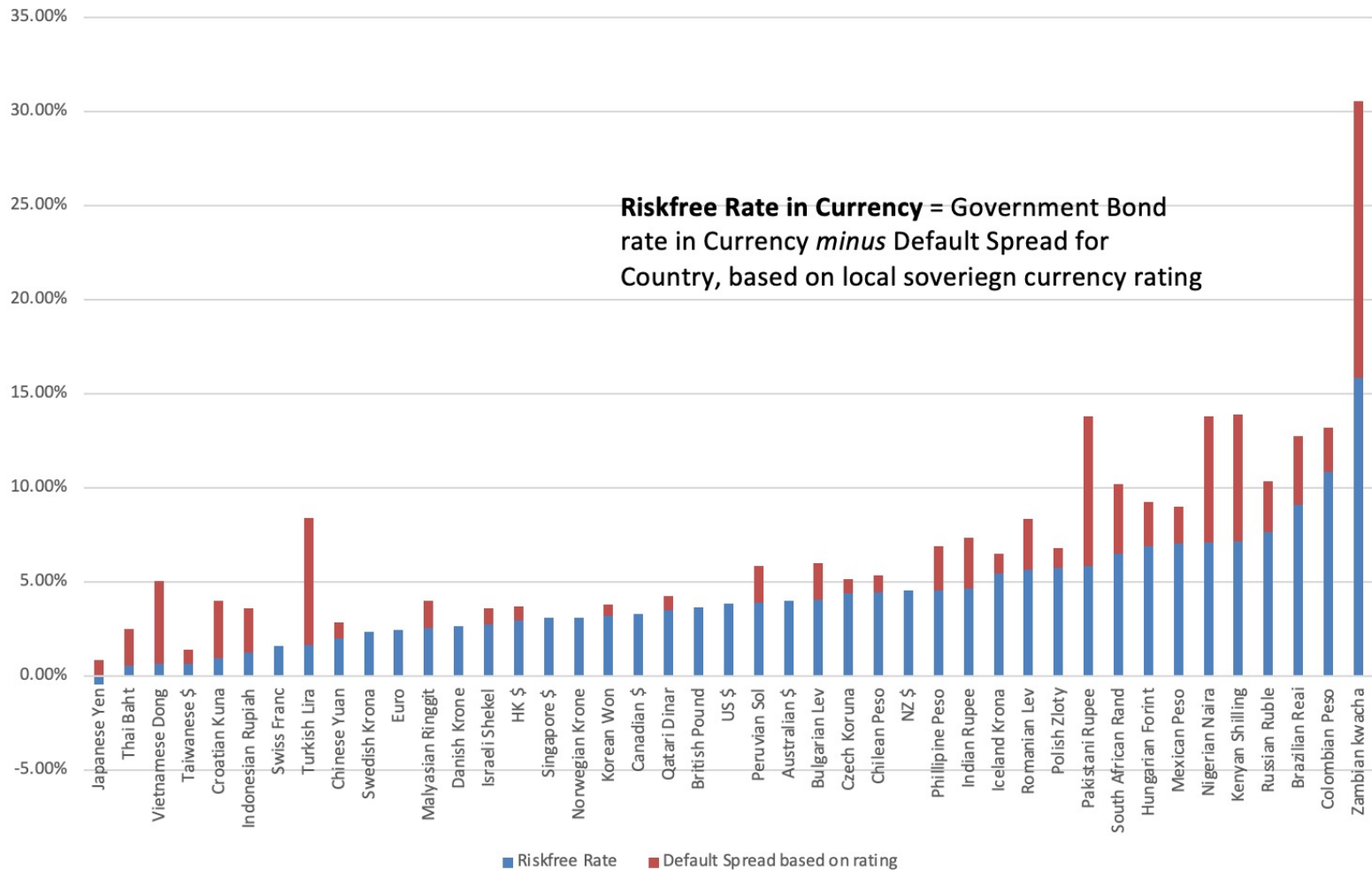   b. This (1.53%) is the real riskfree rate to use, anywhere in the world

    Explain.

Why do risk free rates vary across currencies?
January 2023 Risk free rates
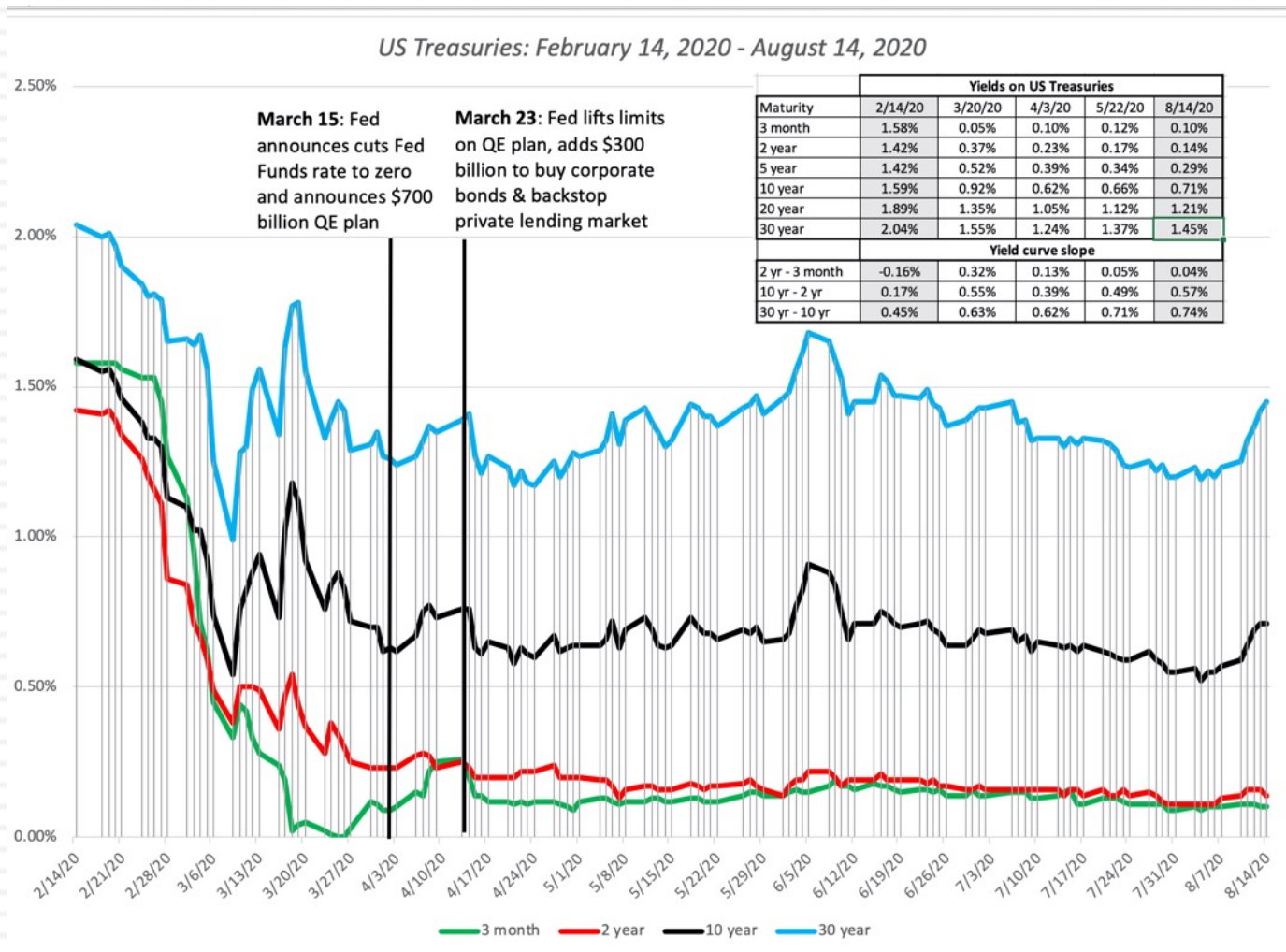

Riskfree Rates in January 2023 : Government Bond Rate-based Estimates

Riskfree Rate in Currency = Government Bond rate in Currency *minus* Default Spread for Country, based on local soveriegn currency rating

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Or across time…

US Treasuries: February 14, 2020 - August 14, 2020

Yields on US Treasuries					
Maturity	2/14/20	3/20/20	4/3/20	5/22/20	8/14/20
3 month	1.58%	0.05%	0.10%	0.12%	0.10%
2 year	1.42%	0.37%	0.23%	0.17%	0.14%
5 year	1.42%	0.52%	0.39%	0.34%	0.29%
10 year	1.59%	0.92%	0.62%	0.66%	0.71%
20 year	1.89%	1.35%	1.05%	1.12%	1.21%
30 year	2.04%	1.55%	1.24%	1.37%	1.45%
Yield curve slope					
2 yr - 3 month	-0.16%	0.32%	0.13%	0.05%	0.04%
10 yr - 2 yr	0.17%	0.55%	0.39%	0.49%	0.57%
30 yr - 10 yr	0.45%	0.63%	0.62%	0.71%	0.74%

March 15: Fed announces cuts Fed Funds rate to zero and announces $700 billion QE plan

March 23: Fed lifts limits on QE plan, adds $300 billion to buy corporate bonds & backstop private lending market

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Risk free Rate: Don't have or don't trust the government bond rate?

- You can scale up the riskfree rate in a base currency ($, Euros) by the differential inflation between the base currency and the currency in question. In US $:

Risk free rate$_{\text{Currency}}$ = $(1 + Riskfree\ rate_{US\ \$})\dfrac{(1 + Expected\ Inflation_{Foreign\ Currency})}{(1 + Expected\ Inflation_{US\ \$})} - 1$

- Thus, if the US $ risk free rate is 2.00%, the inflation rate in Egyptian pounds is 15% and the inflation rate in US $ is 1.5%, the foreign currency risk free rate is as follows:

Risk free rate = $(1.02)\dfrac{(1.15)}{(1.015)} - 1 = 15.57\%$

One more test on riskfree rates...

□ On January 1, 2022, the 10-year treasury bond rate in the United States was 1.51%, low by historic standards. Assume that you are valuing a company in US dollars then but are wary about the riskfree rate being too low. Which of the following should you do?

    a. Replace the current 10-year bond rate with a more reasonable normalized riskfree rate (the average 10-year bond rate over the last 30 years has been about 5-6%)

    b. Use the current 10-year bond rate as your riskfree rate but make sure that your other assumptions (about growth and inflation) are consistent with the riskfree rate.

    c. Something else...

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Some perspective on risk free rates

T.Bond Rate - Actual versus Intrinsic: 1954- 2022

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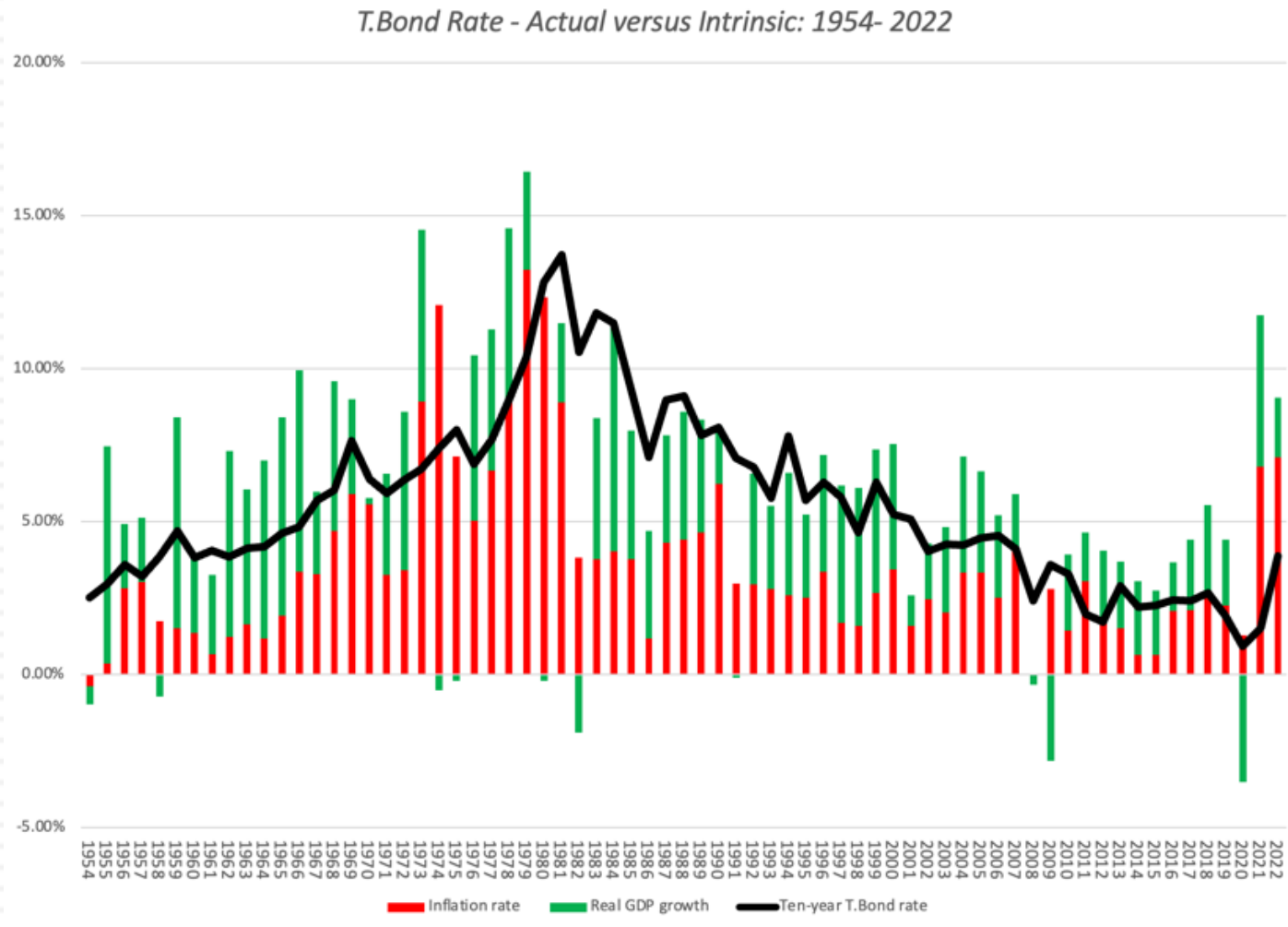
Negative Interest Rates?

- In 2022, there were at least three currencies (Swiss Franc, Japanese Yen, Euro) with negative interest rates. Using the fundamentals (inflation and real growth) approach, how would you explain negative interest rates?
  - How negative can rates get? (Is there a bound?)
  - Would you use these negative interest rates as risk free rates?
    - If no, why not and what would you do instead?
    - If yes, what else would you have to do in your valuation to be internally consistent?

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