DATA 2017 UPDATE 3: CRACKING THE CURRENCY CODE

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Back to the beginning: The intrinsic value equation

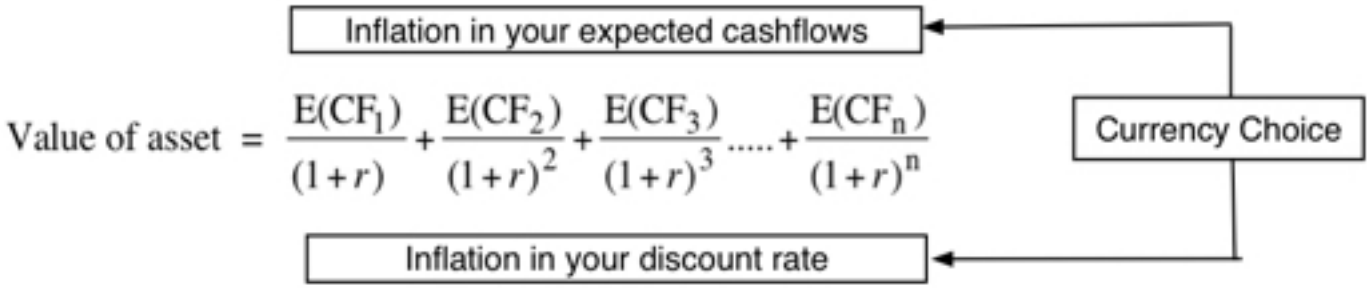
- In intrinsic valuation, the value of an asset is the present value of its expected cash flows, discounted back at a risk adjusted rate.

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots\ldots + \frac{E(CF_n)}{(1+r)^n}$$

- There was a time in the not so distant past, where analysts could do their analysis in their local currencies and care little or not at all about foreign currencies, how they moved and why.
- This was particularly true for US analysts in the last half of the last century, where the US dollar was the unchallenged global currency and the US economy bestrode the world.

The Currency Effect (or non-effect)

- In intrinsic valuation, currency choices affect both the cash flows and the discount rates that you use in valuation:



Two Simple Currency Propositions

- The first is that currency is a measurement mechanism and that you should be able to value any company in any currency, since all it will require is restating cash flows, growth rates and discount rates in that currency.
- The second is that in a robust DCF valuation, your value should be currency invariant. Put differently, the value of Petrobras should be unchanged, whether you value the company in nominal Brazilian Reais ($R), US dollars or Euros.

Currency Estimation Questions

1. Exchange Rate Forecasts: To be able to value companies that operate in different currencies, you have to be able to forecast exchange rates for long periods forward.
2. Discount Rates: To be able to switch from valuing companies in one currency to another, you have to be able to estimate discount rates for a company in any currency.

Exchange Rate Forecasting for Value Invariance

- If you want to make your valuations currency invariant, and inflation is what sets currencies apart, the way to estimate expected future exchange rates is to assume purchasing power parity:

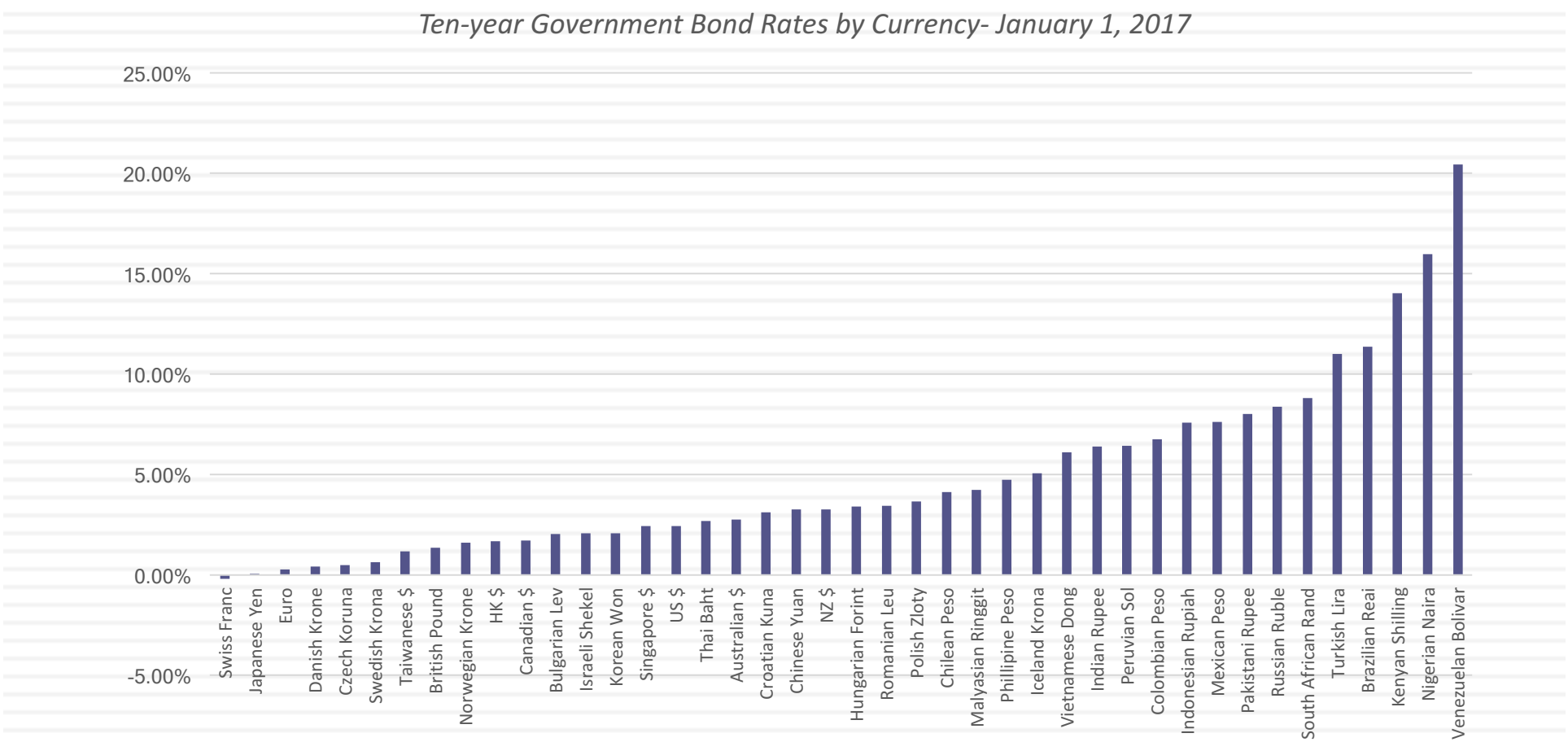
$$\text{Expected LC/FC}_t = \text{Current LC/FC}\left[\frac{(1 + \text{Inflation Rate in LC})^{\square}}{(1 + \text{inflation Rate in FC})}\right]^t$$

- Even if you have strong currency views, it is best to keep them out of your company valuations, since your valuation conclusions will then be joint effects of your company and currency views.

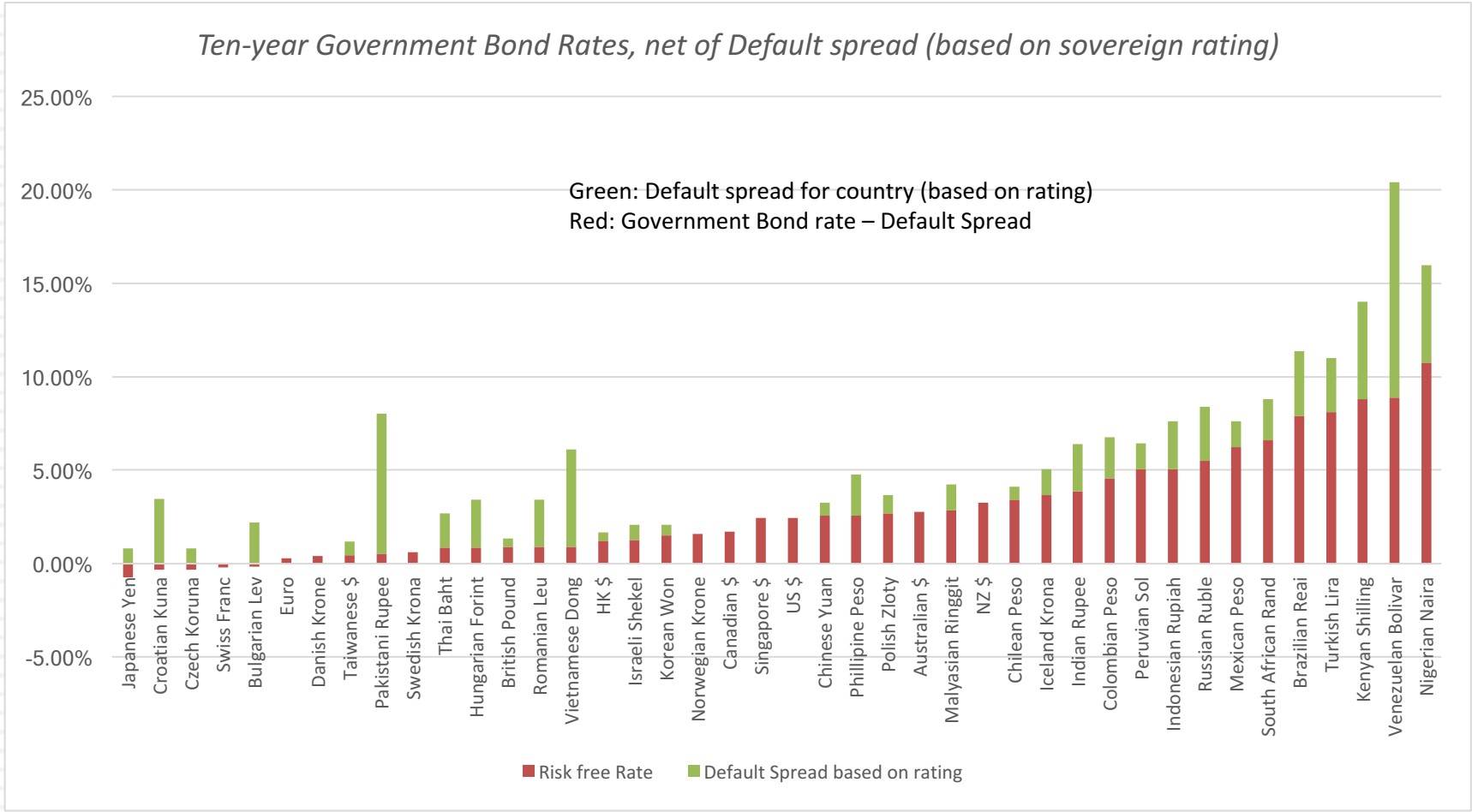
Discount Rates: Two ways of estimating currency-specific discount rates

- Ground up: In this approach, you start by estimating the risk free rate in the local currency and then build up to the cost of equity and capital, using whatever build up mechanism (betas, risk premiums) thatyou use in any other currency.
- Differential Inflation: In this approach, you estimate your cost of equity or capital in the currency that you feel most comfortable working in and then use differential inflation to convert it into a different currency.

Risk Free Rate 1: Government Bond Rates



Risk free Rate 2: Government Bond rate, net of default spread



Riskfree Rate 3: Differential Inflation

- You start with a risk free rate in a currency where you believe that the government bond rate is a reliable measure of the risk free rate (and then add to this number the differential inflation rate between the US dollar and the local currency.
  - Local Currency Risk free Rate = US $ Risk free Rate + (Expected inflation in local currency – Expected inflation in US $)
- This is an approximation that works reasonably well when local currency inflation is low (close to the US dollar inflation rate) but the more precise version of this formulation:

$$\text{Local Currency Riskfree Rate} = (1 + \text{US \$ Riskfree Rate}) \frac{(1+\text{Inflation Rate in local currency})}{(1+\text{inflation Rate in US \$})} - 1$$

Riskfree Rate 4: Synthetic Risk Free Rate

- Start with the Fisher equation
  - Risk free Rate = Expected Real Interest Rate + Expected inflation rate
- You can augment this equation with the assumption that long term real growth in an economy will converge on the long term real interest rate.
  - Expected Real Interest Rate = Expected Real Growth Rate
  - Synthetic Risk free Rate = Expected Real Growth Rate + Expected inflation rate
- If you are able to estimate expected inflation and real GDP growth for the long term for an economy, the risk free rate for the currency of that economy will be the sum of the two.

Cost of Capital + Inflation Differential

- If you start with a risk free rate in a local currency and build up to a cost of capital using equity risk premiums and default spreads, often available only in dollar-based markets, you are effectively assuming that risk premiums are absolute numbers that don't change as the risk free rate changes.
- If you want to scale them all up, here is the simple solution:

$$\text{Local Currency Cost of Capital} = (1 + \text{US \$ Cost of Capital}) \frac{(1+\text{Inflation Rate in local currency})}{(1+\text{inflation Rate in US \$})} - 1$$