

The Philippine Government Bond Market: Making Sense of the Yield Curve

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1 Background

The Philippine Government Bond Market is still at a very early stage of development, and it currently faces problems regarding bond liquidity, and the absence of two-way pricing quotes, among other things. However it cannot be denied that the market has seen substantial improvements over the last decade. First, trading activity has significantly increased from its levels in 2005, Table 1 shows this dramatic increase. Second, the Philippine and Dealing Exchange Corporation (PDEX) has established a working electronic trading and settlement platform to facilitate transactions. More importantly however, PDEX is recording most of the transactions executed in the system, they are maintaining a database of prices, yields and transaction volume for each trading day. This service has significantly improved the efficiency of the price discovery process, and provided much needed transparency in the market. Lastly, the government itself has begun initiatives to rationalize its regulations, facilitate the creation of a repo market, and institute an effective primary dealer system to address the above-mentioned issues of liquidity and pricing.

Table 1: Trade Volume Trends (in billion pesos)

Month	2005	2007	2009	2011	2013	2015
Jan.	0	151,441.19	313,547.08	308,296.37	917,961.66	854,151.65
Feb.	0	130,322.80	188,434.60	141,527.30	941,795.83	408,648.14
Mar.	5,264.55	106,935.20	206,472.47	201,643.62	1,047,062.70	249,094.94
Apr.	61,077.03	53,964.18	235,503.42	266,057.47	625,896.71	182,089.59
May	86,862.58	132,375.58	282,282.11	170,696.50	401,434.53	253,274.43
Jun.	59,550.99	62,939.81	199,619.02	334,149.07	245,520.01	288,893.06
Jul.	46,186.00	69,069.42	240,767.86	494,627.39	389,830.25	295,875.85
Aug.	40,835.75	59,312.49	172,293.04	645,526.56	184,684.91	325,178.45
Sep.	28,783.90	198,306.74	233,472.42	546,505.98	210,372.01	167,986.89
Oct.	27,873.05	205,046.15	224,215.77	337,609.40	343,492.94	211,546.55
Nov.	60,437.49	171,109.29	158,473.39	297,859.37	303,169.34	107,200.03
Dec.	20,872.89	223,278.35	126,532.31	418,148.29	120,780.90	79,432.31
Total	437,744.25	1,564,101.30	2,581,613.48	4,162,647.32	5,732,001.81	3,423,371.89

Source: Philippine Dealing and Exchange Corporation

Philippine government securities (GS) differ from other sovereign bonds in terms of quoting convention and the application of a withholding tax. GS are quoted on the basis of the yield-to-maturity (YTM), rather than price and because of the withholding tax, dealers make a distinction between gross (clean) yields and net (clean) yields.

In the Philippines, deposit substitutes, of which GS is classified as, are subject to a 20% final withholding tax. Furthermore this tax is withheld at source, so an ordinary investor receives only 80% of the stated coupon amount. In terms of terminology, gross yields refer to YTM without the tax adjustment, while net yields refer to YTM after deducting the 20% tax. Settlement amount is based on the price calculated using the net yield.

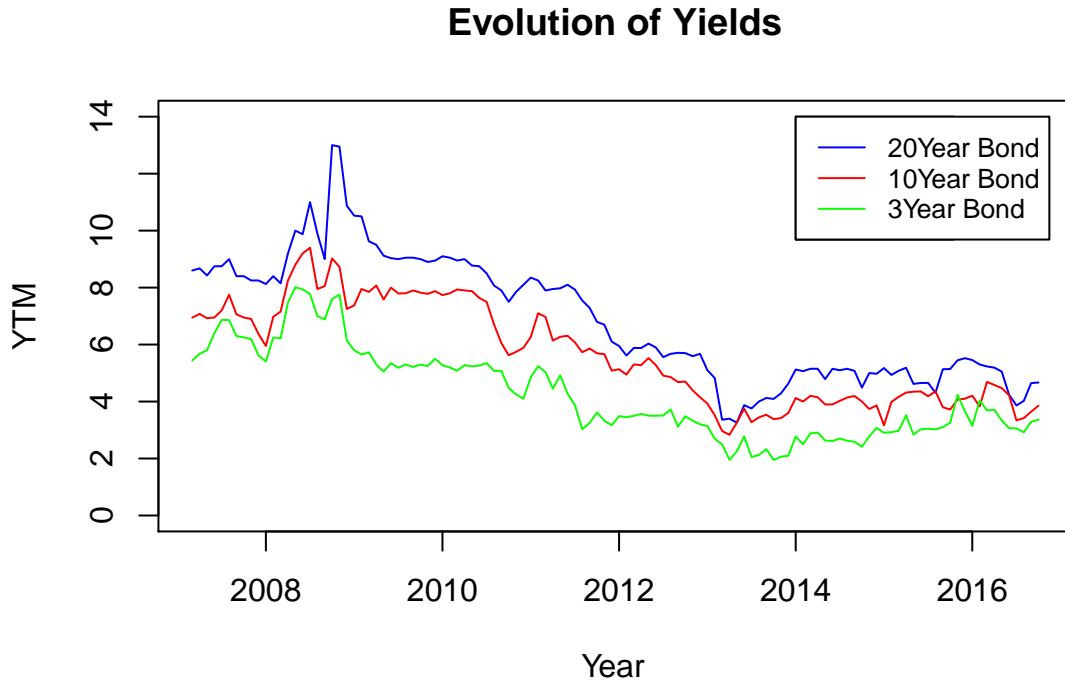
It is important to note that the application of the tax is based on the status of the holder or investor, there are tax-exempt institutions like government-run pension funds which do not see their coupon earnings reduced by the tax. It should be fairly obvious that this arrangement might make trading between investors of different tax classification a bit more complicated, what is the correct price, for instance? This is one of the reasons why trading between taxable and tax-exempt institutions were prohibited in the past, in fact it is only last May 2015, where this restriction was finally removed.

2 The New Normal

Half a decade ago, the coupon rate on long-term Philippine sovereign debt hovered around 8.0-9.0%, today 20-year bonds have a yield of 4.6-5.0%, nearly a 50% reduction in borrowing costs. What happened? Figure 1 shows that this yield compression happened across all maturities of the yield curve, this was clearly not due to technical trading reasons but because of changes in the underlying fundamentals of the country (or at least how it was viewed) and dynamics in the global financial system.

Not only have yields gone down across the board, but the spread between different maturities have significantly tightened. It is however important to note that this yield compression was actually experienced all over the emerging market economies as the zero-interest rate policy of the advanced economies, particularly the Federal Reserve has encouraged investors to hunt for yields. They did so by taking a closer look at the fundamentals of these countries and judging that they are good investment opportunities. The Philippines has been a major beneficiary of these capital flows, particularly as it led to massive decreases in the cost of borrowing, which freed up fiscal space in order to pursue programs to increase economic growth.

Figure 1: Yield Compression



3 Understanding the Determinants of Yields

What was mentioned in the previous section regarding the massive capital flows is a very popular narrative, but the question remains: is it empirically justified? In order to provide the answer, we need to study which economic factors best determine the level of yields. As market participants are generally forward-looking, another related but important question is which economic variables or models best predict the future path of yields.

This initiative is impossible without data, luckily the PDeX has been keeping records of monthly yield data from as far back as March 2007. Table 2, offers some basic statistics of the yield dataset in study. It is important to note that what is being described by the data is not an actual instrument but a reference rate of specific yield curve tenors, the exact bonds used to calculate these rates will be different as these bonds will have differing maturities as time passes. As much as we would prefer to use continuously issued on-the-run securities to calculate these reference rates, it is impossible to do so given the state of development of the Philippine bond market.

Table 2: Summary Statistics

Tenor	Obs.	Last	Mean	Standard Deviation	Skewness	Kurtosis
1 month	116	1.40%	2.71%	1.56%	0.38	-0.71
3 month	116	1.42%	2.65%	1.63	0.48	-0.65
6 month	116	1.55%	2.90%	1.71%	0.44	-0.85
1 year	116	1.34%	3.22%	1.79%	0.48	-0.90
2 year	116	2.34%	3.87%	1.61%	0.67	-0.79
3 year	116	3.36%	4.25%	1.55%	0.58	-0.64
5 year	116	3.81%	4.80%	1.62%	0.19	-0.42
7 year	116	3.62%	5.26%	1.65%	0.34	-1.16
10 year	116	3.85%	5.65%	1.77%	0.26	-1.31
20 year	116	4.67%	6.87%	2.19%	0.38	-0.70

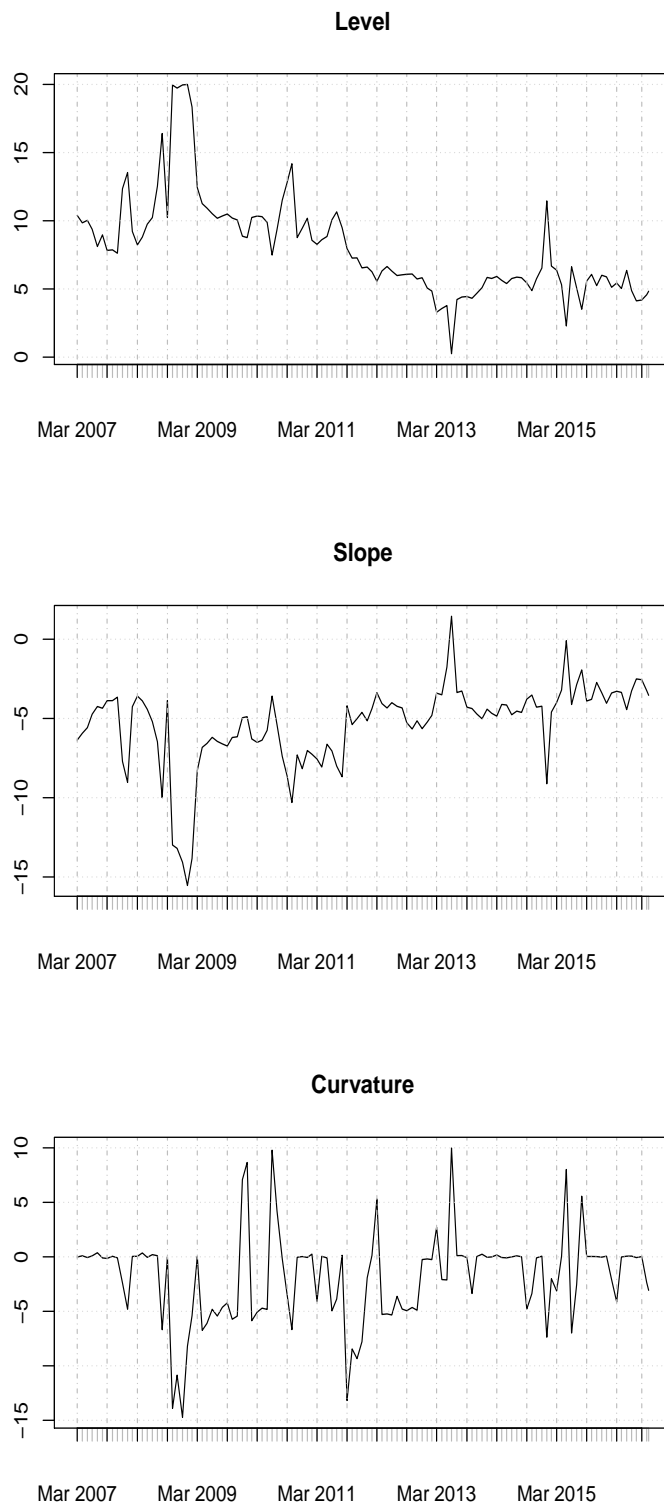
Our analysis will be greatly aided if we can somehow summarize these ten reference points into two or three variables so we can instead focus not on the individual tenor points but on the yield curve itself. This is what Nelson and Siegel (1987) did, which was re-interpreted and further extended by Diebold and Li (2006). The Nelson-Siegel yield curve is defined as follows:

$$y_t(\tau) = \beta_{0t} + \beta_{1t}\left(\frac{1 - e^{\lambda_t\tau}}{\lambda_t}\right) + \beta_{2t}\left(\frac{1 - e^{\lambda_t\tau}}{\lambda_t} - e^{\lambda_t\tau}\right)$$

$y_t(\tau)$ is the yield of tenor τ at time t . Diebold and Li (2006) showed that the parameters β_{0t} , β_{1t} and β_{2t} can be interpreted as three latent dynamic factors describing the *level*, *slope*, and *curvature* of the yield curve respectively. These three parameters are estimated using the tenor points summarized above. This exercise can have potentially important implications as the Philippine government actively uses a modeled yield curve to properly value its own securities. Figure 2 shows the evolution of these parameters through the years.

Diebold and Li (2006) has also shown that summarizing the yield curve in terms of these three parameters can help generate a robust forecasting model. However it remains to be seen if this will be true in the Philippine context as well.

Figure 2: Yield Curve Parameters



References

- Diebold, Francis X and Canlin Li**, “Forecasting the term structure of government bond yields,” *Journal of econometrics*, 2006, *130* (2), 337–364.
- Nelson, Charles R and Andrew F Siegel**, “Parsimonious modeling of yield curves,” *Journal of business*, 1987, pp. 473–489.