

US Treasury Yield Curve Trading Strategy

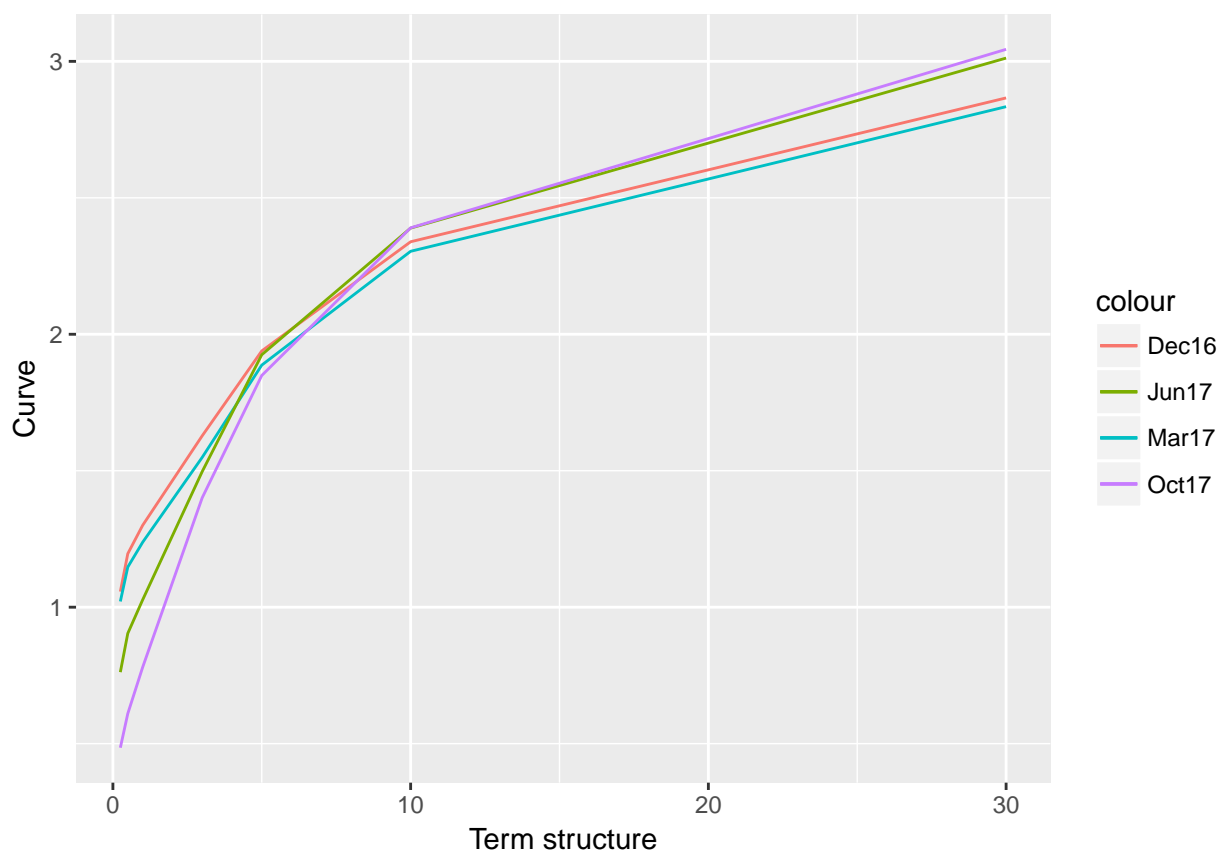
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US Fed Rates Hike History

Date	Fed Fund Rate
Jun 22, 2011	0-0.25%
Dec 16, 2015	0.25-0.5%
Dec 14, 2016	0.5-0.75%
Mar 15, 2017	0.75-1%
Jun 14, 2017	1-1.25%

US Treasury Yield Curve Changes



Break down the curve change

Before forecasting the curve change on Dec 2017, it is necessary to take a closer look at previous curve changes after rate hikes.

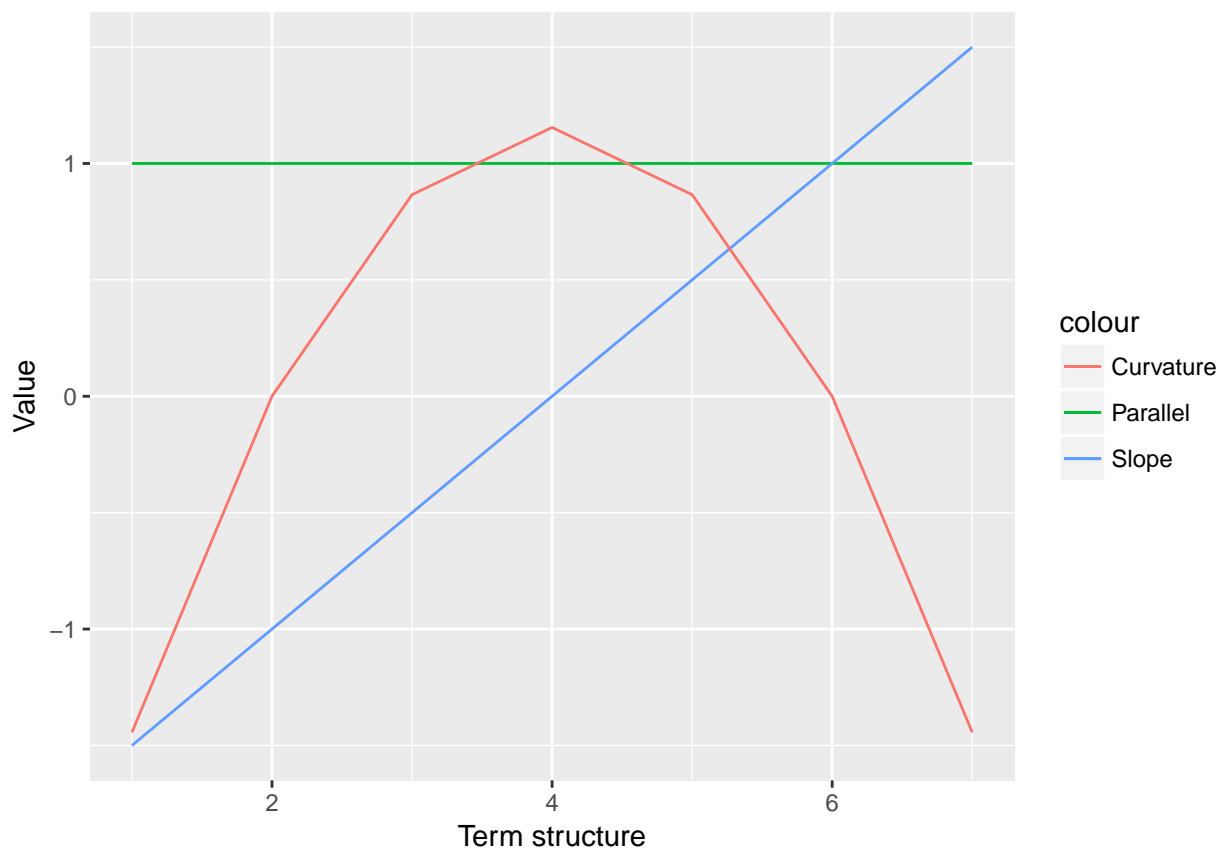
We can break down the curve change into three categories: **Parallel shift**, **Slope shift** and **Curvature shift**. All these shifts are orthogonal, which means they do not have cross effects.

$$\Delta \vec{C} \approx \Delta x_1 \vec{P}_1 + \Delta x_2 \vec{P}_2 + \Delta x_3 \vec{P}_3$$

$\Delta \vec{C}$ stands for curve change denoted by a vector.

We can easily use a set of orthogonal basis – polynomials.

3 orthogonal basis



With the tool of orthogonal basis, we can nail down what effect the rate hike had on the curve structure and forecast next curve change.

We can get the changes by following formula:

$$\Delta x_1 = \frac{\Delta \vec{C} \cdot \vec{P}_1}{\|\vec{P}_1\|}$$

##	temp	dx1	dx2	dx3
##	8 Mar 17	0.13671429	-0.120571429	0.005278631
##	5 Jun 17	0.06628571	-0.158285714	0.013279056
##	2 Oct 17	0.04928571	-0.003571429	0.013114099

Take the curve change on Mar 17 as an example:

Here are what we observed:

1. Rate hikes caused an upward parallel shift. However, marginal effects on parallel shifts are decreasing.
2. Rate hikes made the curve less tilted.
3. Rate hikes caused an increasing concave change. Curvature change effect is quite stable.

Furthermore, we observe that these three basis explained 90% of curve changes.

Forecast curve change on Dec 2017

It is predicted that there will be another rate hike in Dec 2017. Assume it has similar effect on the curve, that is, assume same factor loading on **Parallel shift**, **Slope shift** and **Curvature shift**. Hence, we forecast that the curve will have a slight upward parallel shift, and become less tilted and become more concave.

To illustrate it with numbers, we have:

$$\Delta x_1 =$$

$$\Delta x_2 =$$

$$\Delta x_3 = 0.13$$

Trading strategy

As we forecasted, the rate curve will move upward with a less tilted slope and a more concave curve.