Fixed Income Assignment 2

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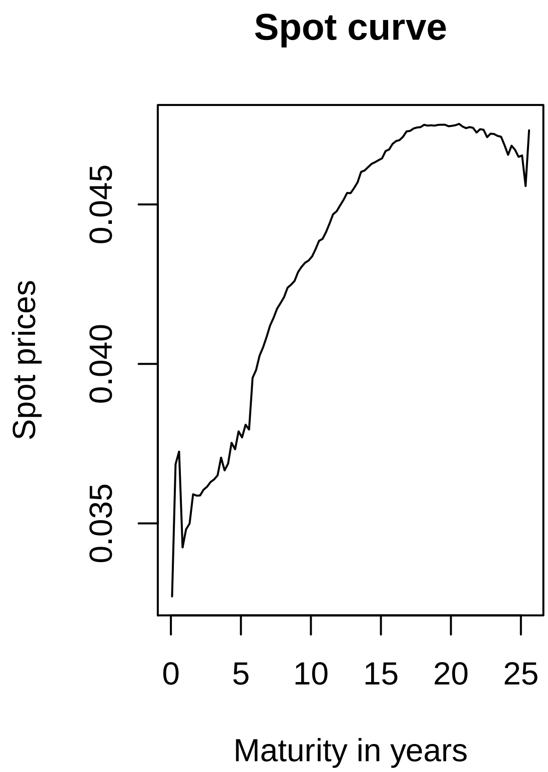
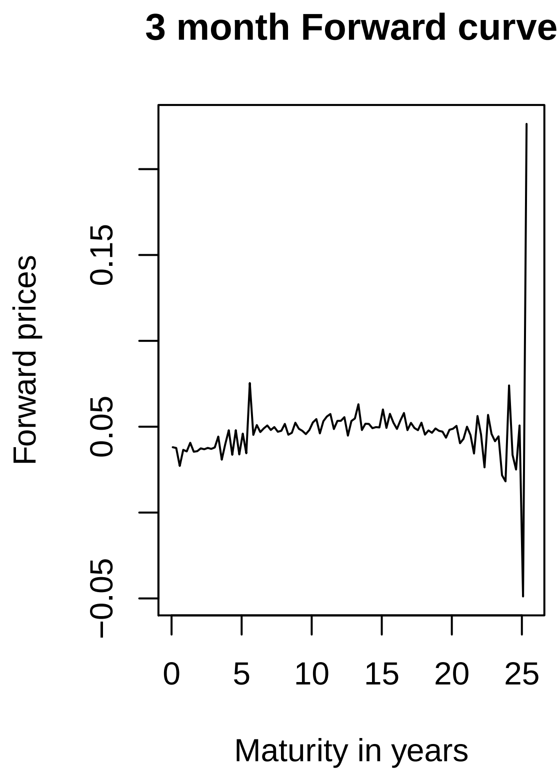
Question 1

Given the STRIP prices, we can calculate the D(T) = $\frac{price}{100}$
The plots of the spot and forward graph are as below





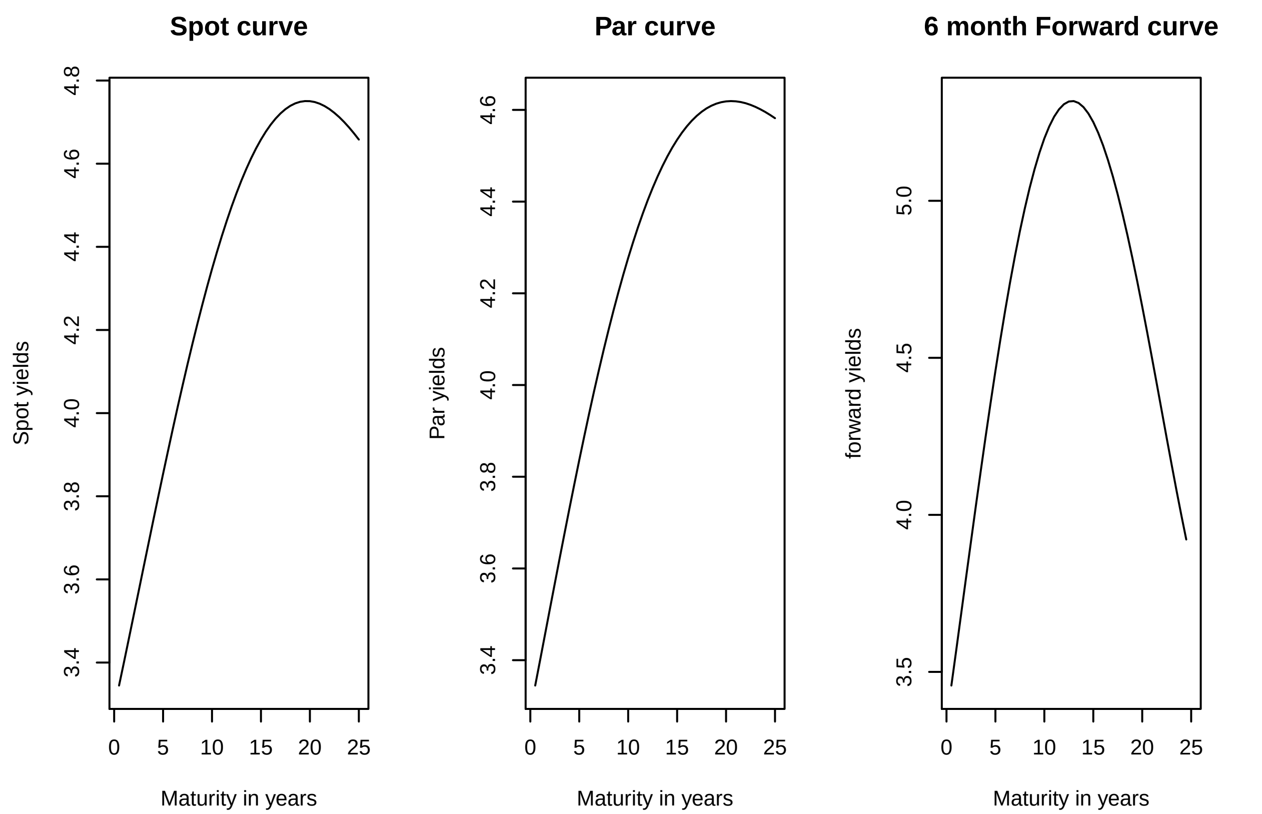
Question 2

In order to get the data for other maturities, we can run a regression between DT and various powers of maturity.
Once we get that, we can get D(T) for any maturity.
The Coefficients of regression are as below:

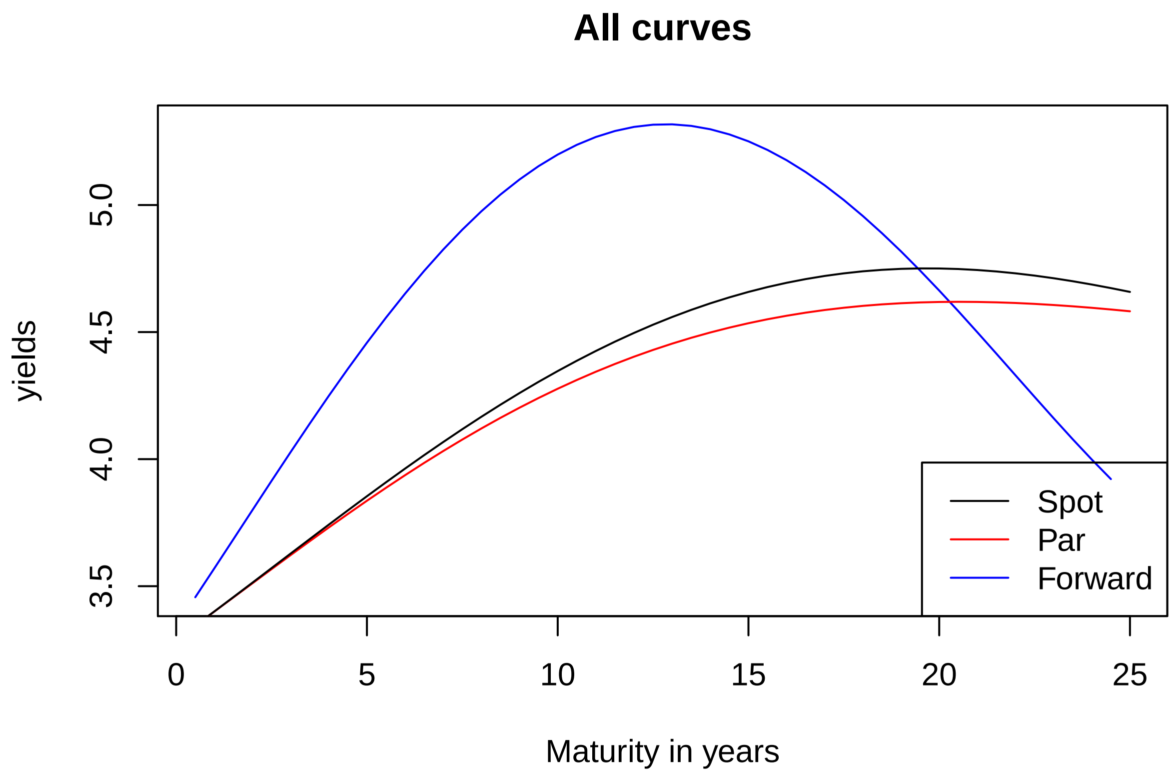
Maturity	Mat2	Mat3	Mat4	Mat5
-0.032628	-0.0010747	-1.98e-05	2.8e-06	0

Question 3,4,5

Given the regression coefficients, we can find D(T) at any maturity, which allows us to find spot rate, par rate and forward rates at those maturities. The graphs are as below



If all the graphs are plotted together



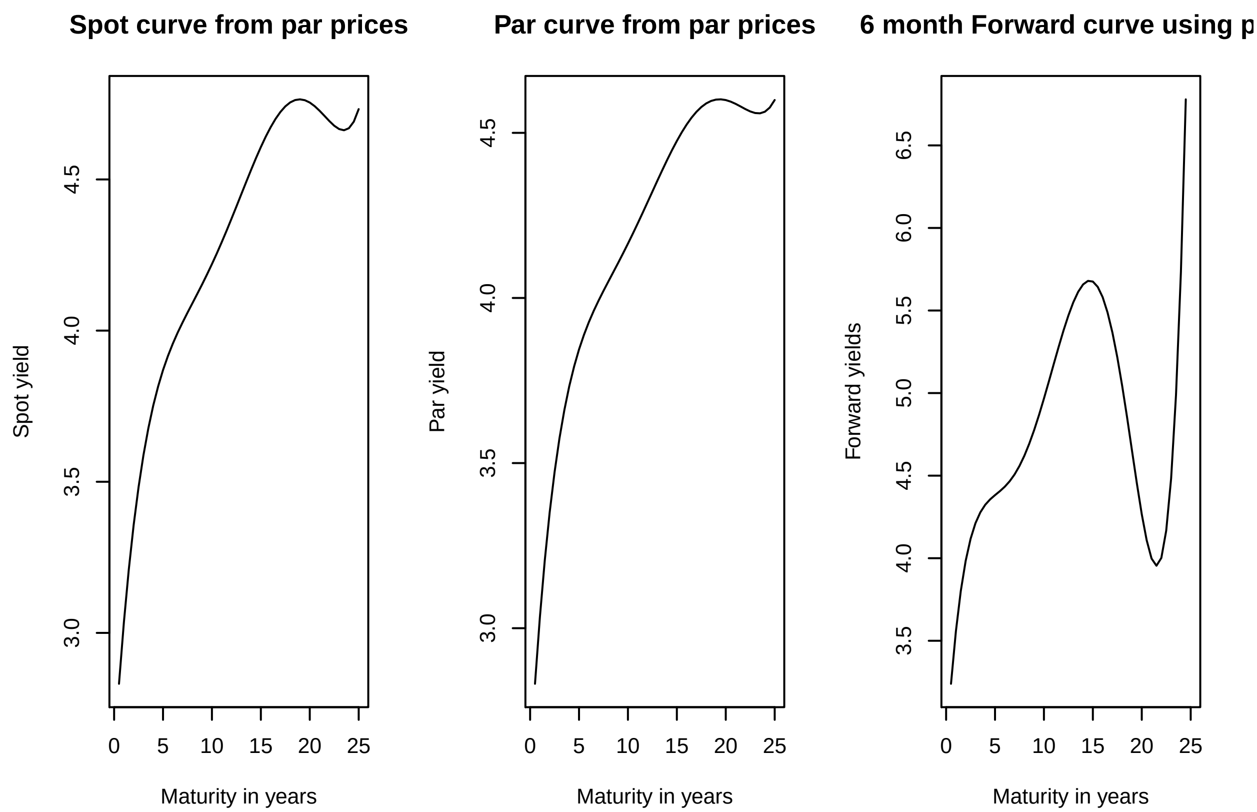
Question 6

Using Treasury coupon notes, we can run a regression between yields and powers of maturity. The coefficients of regression are as below:

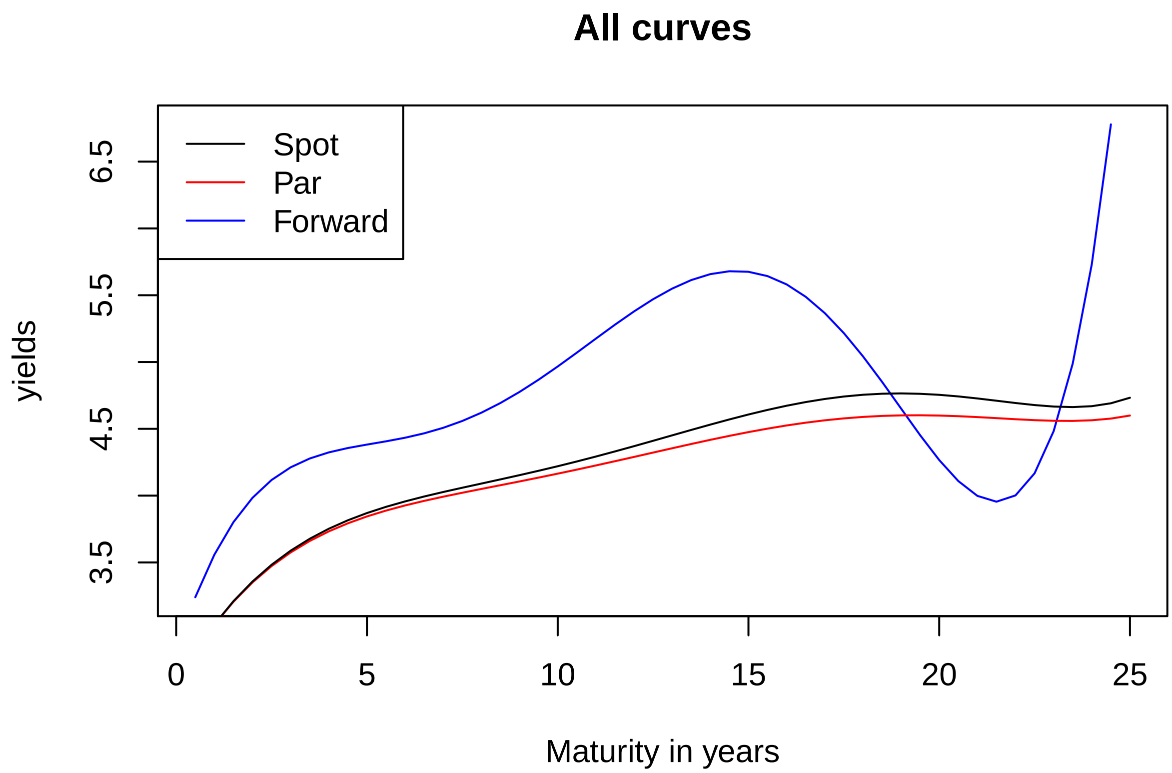
Intecept	Mat	Mat2	Mat3	Mat4	Mat5
2.594358	0.5126526	-0.0794252	0.0065459	-0.0002517	3.6e-06

Now we can bootstrap the D(T) values for all values from 0.5 to 25 years. For every bootstrap D(T) calculation on a maturity, we will need all D(T) prior to that maturity and the yield for that maturity (got out of the regression)

The Spot, Par and Forward curves are as below



If we plot all graphs together



Question 7

Forward Yields
When fitting the STRIPS curve, the spot rate was strictly increasing until a tenor of 20.5 years. After that, the spot rate begins to decrease. Therefore, the forward curve is above the spot rate before this point and is below it after this point. (If the forward curve is not above the spot curve when it is increasing, then there are arbitrage opportunities). The curve is also smoother since the spot rate it is derived from is also smoother.

But when fitting the par curve, the spot curve is strictly increasing and then strictly decreasing. It is increasing until a tenor of 19 years, decreasing between a tenor of 19 years and 23.5 years, then increasing again after 23.5 years. As a result, our forward curve crosses the spot curve in two spots (at year 19 and at year 23.5).

Spot and Par Yields
The par yields for both curves are similar. The par curve is monotonically increasing so this means we are dealing with a normal yield curve: short-term debt has a lower yield than long-term debt (upward sloping). As a result, the par yield is slightly above the spot yield at all maturities.

One interesting thing to note is that the spot and par yields derived from fitting the STRIPS curve are generally higher than the ones fitted by the par curve. This suggests that bonds priced using the STRIPS curve are cheaper than the ones derived from the Par Curve. We attribute this to a liquidity premium. The on-the- run market for Treasury bonds is orders of magnitude larger than the STRIPS market. Therefore, they command a lower yield. When we include these points in the T-bond derived curve, our yields will get dragged lower across the board. For example, at the 6-month maturity, the STRIPS-derived spot/par yield is 3.3447%. The 6-month maturity for the T-bond derived spot/par yield is 2.8316%. The spread here is 51 basis points and suggests that the T-bond derived rate is richer than the STRIPS-derived rate.