Question 5: Volatility Modelling

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1. Introduction

This question investigates the Rand's notorious volatility. To this I first fit a univariate GARCH in order to investigate the structural volatility of the Rand. I then compare it with other highly volatile currencies. Finally, I fit a multivariate GARCH between the Rand and a G10 currency basket. It appears that, although the Rand is volatile, it is far from the most volatile currency.
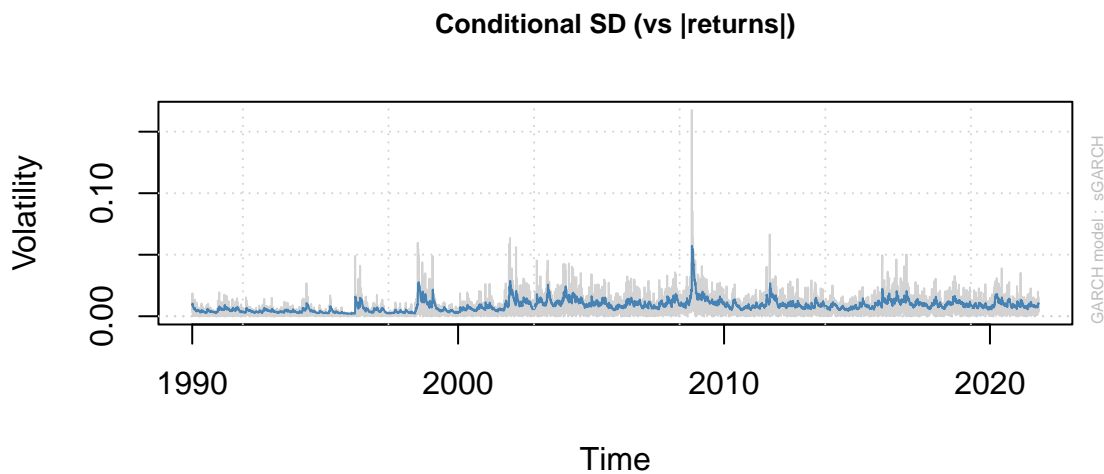
Conditional SD (vs |returns|)

Figure 1.1: Conditional SD of Rand

The plot above shows the structural volatility of the Rand compared to the noise.

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Name	SD
Nigeria	0.0382584
Romania	0.0328795
Bulgaria	0.0169528
Zambia	0.0144492
Ghana	0.0132018
Russia	0.0123983
Brazil	0.0122549
Turkey	0.0121950
Argentina	0.0104157
SouthAfrica	0.0095090

The table above shows the top 10 most volatile currencies ranked. South Africa is ranked 10th. While not the most volatile, it is certainly high, considering we have 41 currencies in the dataset. Nigeria takes the top spot with a SD of 0.0383.
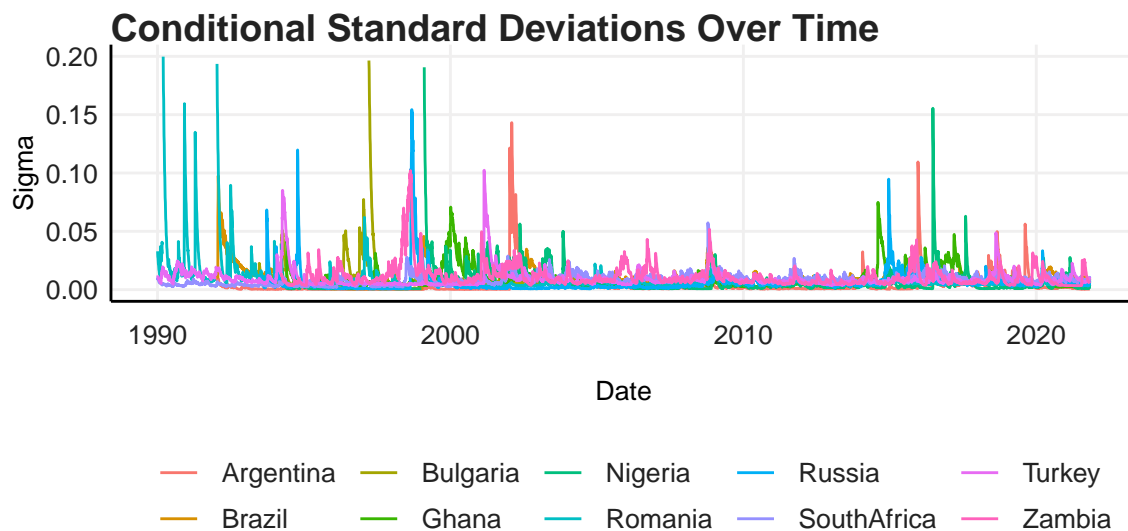

Figure 1.2: Conditional Standard Deviations Over Time

The plot above shows the conditional standard deviations over time for the top 10 most volatile countries. What is immediately apparent is that every currency experience volatility spikes. However, these spikes occur at different times for different countries, indicating that the structural volatilities don't tend to follow each other.

```
## Sample mean of the returns:  7.9159e-05 0.0001874877
```

```
## Component:  1
## Estimates:  0 0.149704 0.873896
## se.coef   :  0 0.009268 0.006297
## t-value   :  0.016086 16.15231 138.7861
## Component:  2
## Estimates:  2e-06 0.069454 0.918007
## se.coef   :  0 0.006724 0.008132
## t-value   :  4.480019 10.32997 112.8907


## Estimates:  0.95 0.03294096 7.796205
## st.errors:  NaN NaN 0.4423782
## t-values:   NaN NaN 17.6234
```
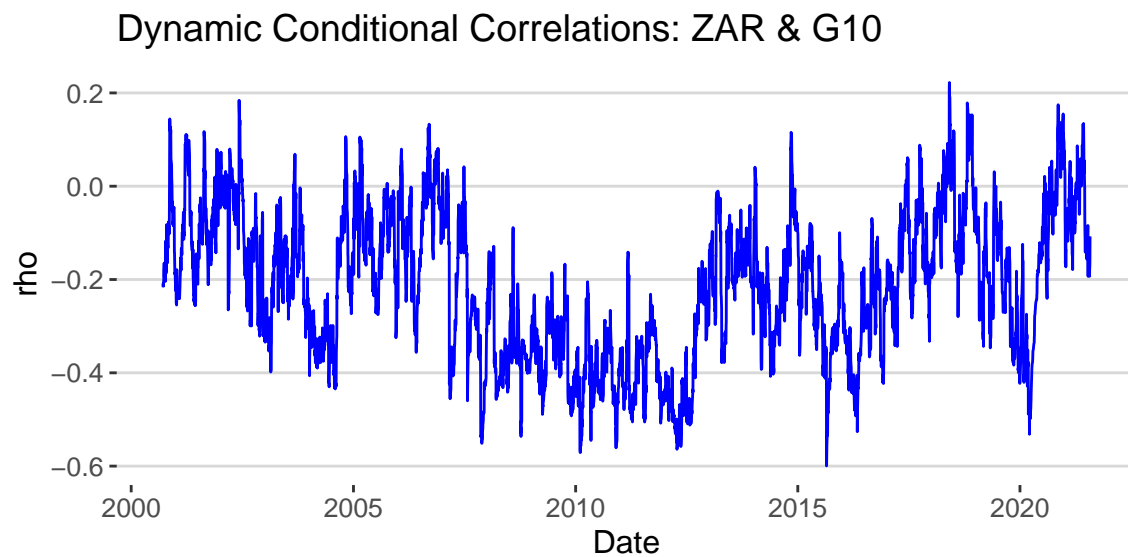

Figure 1.3: Dynamic Conditional Correlations: ZAR and G10

The plot above shows the dynamic conditional correlation of the ZAR and the G10 basket.