Question 5

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Abstract

Currency volatiltiy analysis using GARCH methodologies.

## 1. Volatility of the ZAR

| Name	avg_std_dev	rank
Israel	0.0034227	32
India	0.0032137	33
Singapore	0.0030857	34
Thailand	0.0028940	35
Philipines	0.0025418	36
China	0.0023430	37
Taiwan	0.0022633	38
HongKong	0.0003695	39
Saudi	0.0001530	40
UAE	0.0000124	41

The table above ranks countries by their currencies average volatility, measured by the average scaled dlog returs standard deviation, since 2018 and it shows that the South Afican ZAR has been the 8th most volatile currency. But this may be due to noise.
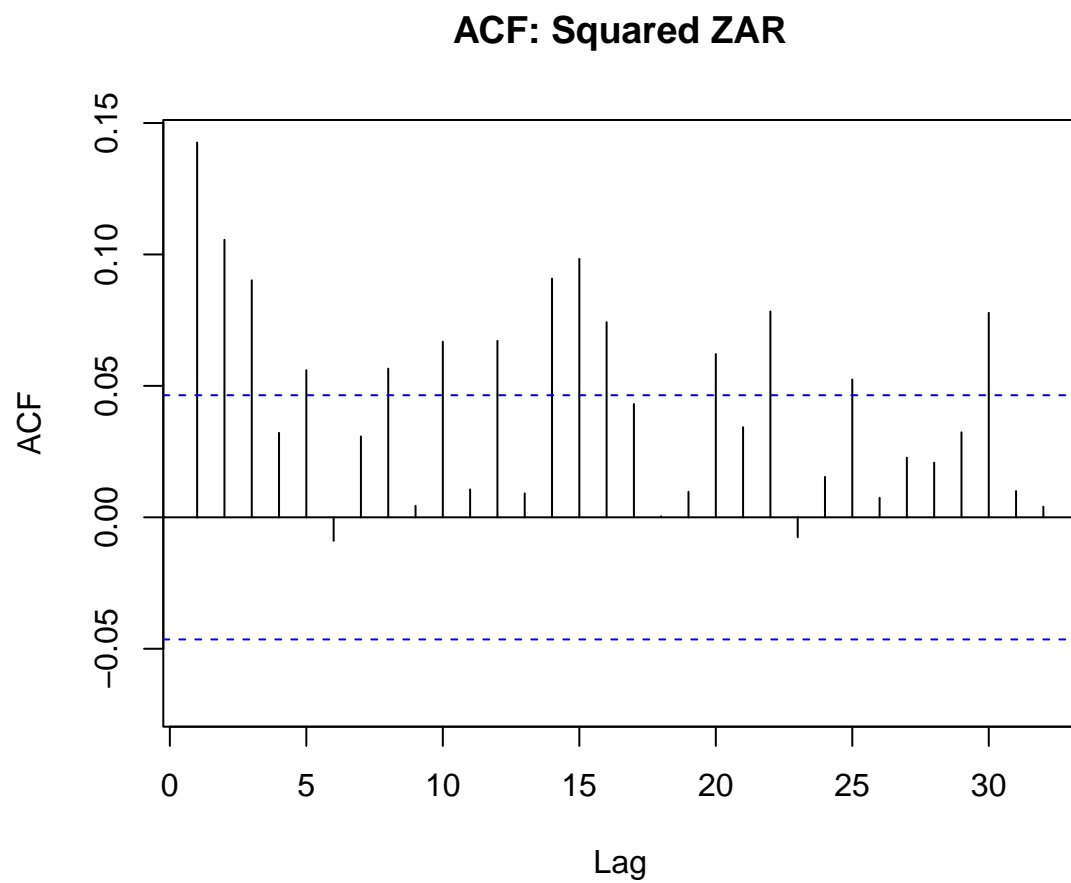
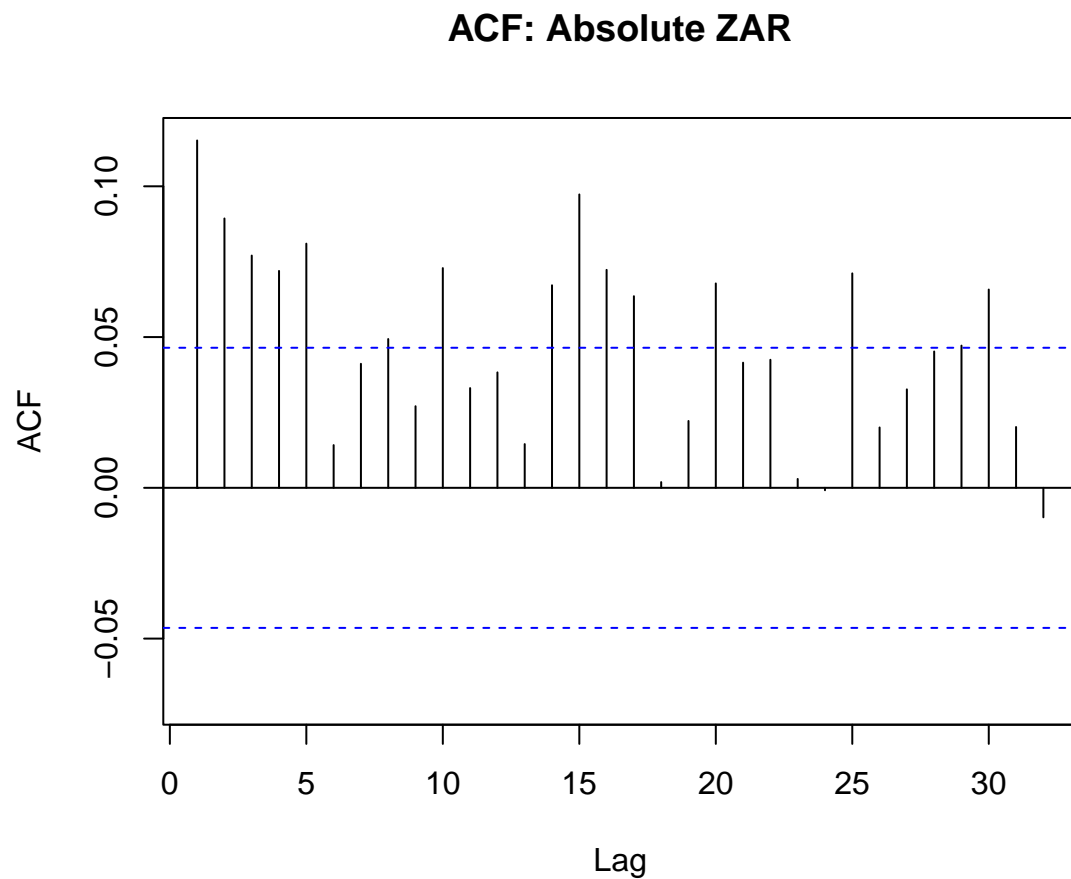*Corresponding author: Wesley James Williams
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Return Type Persistence: ZAR
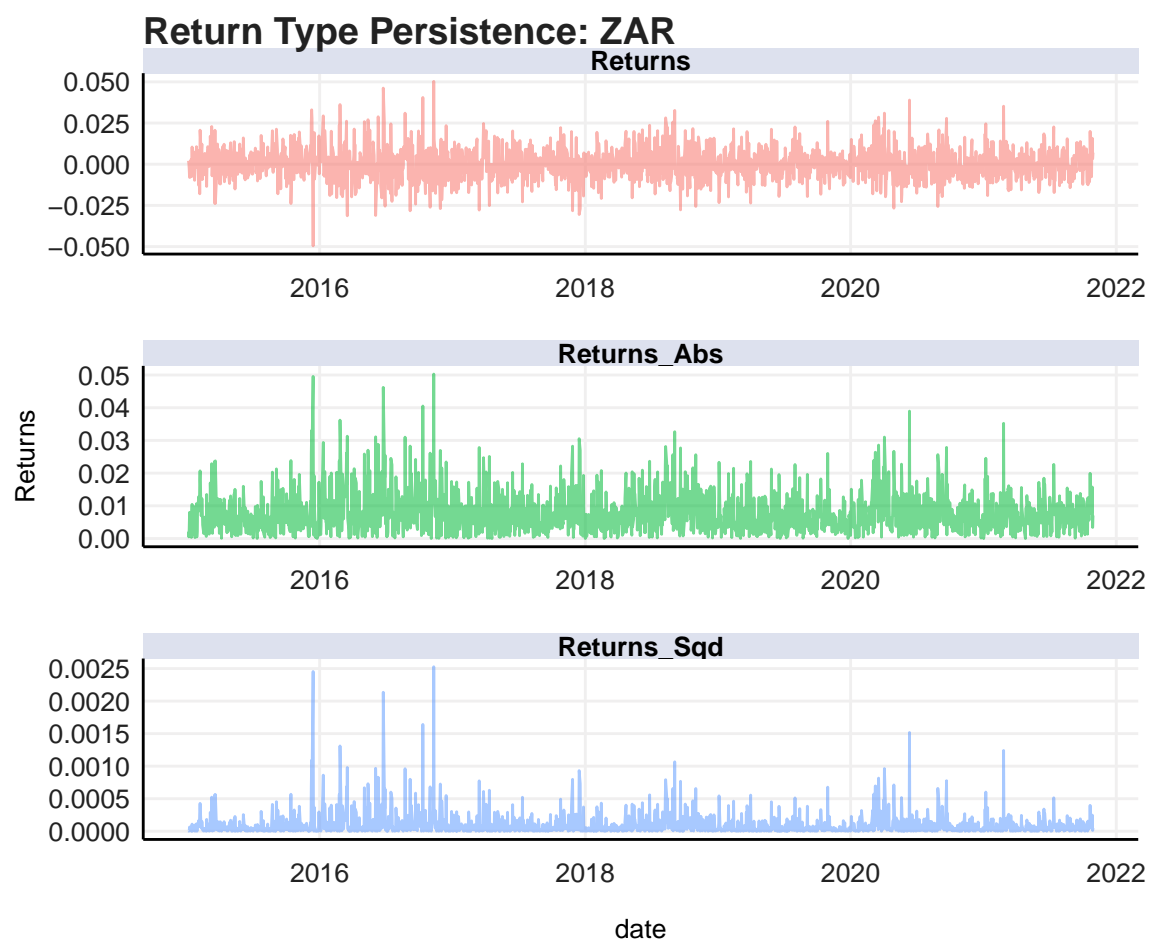
The figure above shows clear signs of both first and second order persistence. To verify this I plot the ACFs.

ACF: ZAR

ACF: Squared ZAR

ACF: Absolute ZAR
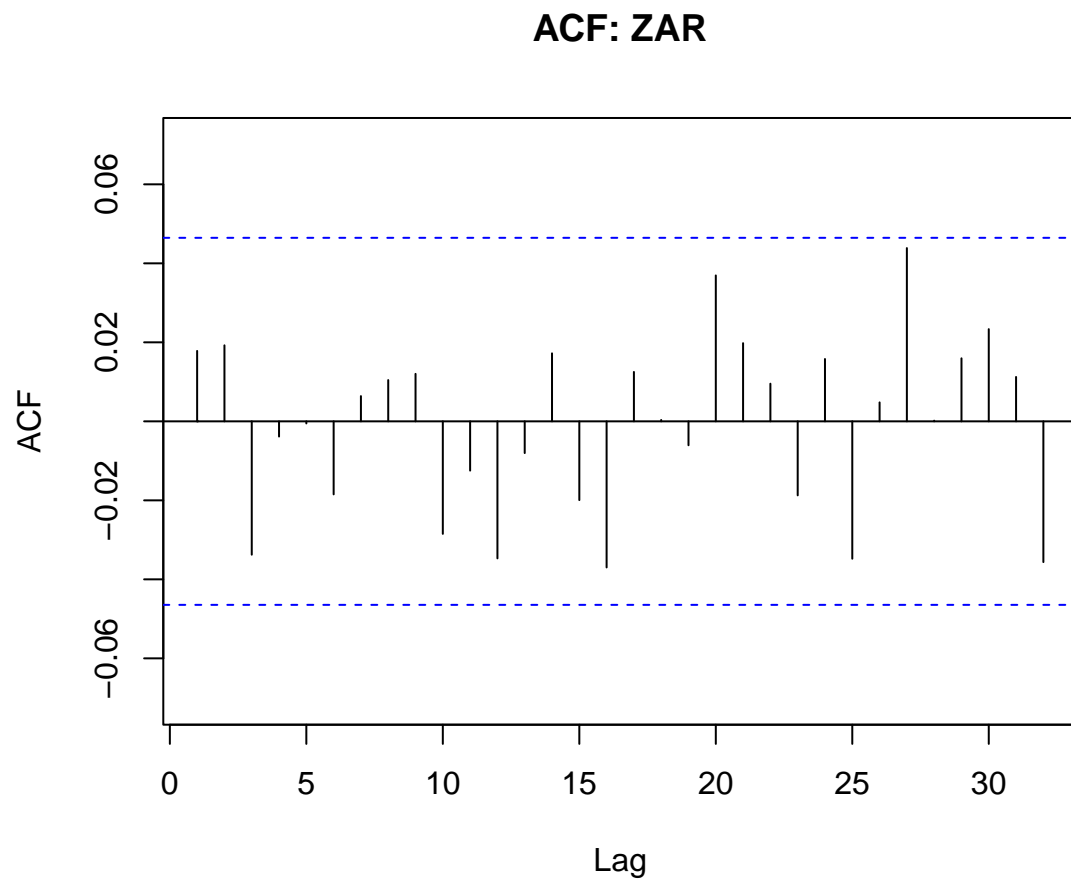

```
##
##  Box-Ljung test
##
## data:  coredata(zar_rts^2)
## X-squared = 101.98, df = 12, p-value = 2.22e-16
```

Both the ACFs and the Box-Ljung test confirm that there is strong conditional heteroskedasticity, as well as long memory. The null hypothesis of no ARCH effects is rejected by the small p-value. ## Fitting the GARCH

	Estimate	Std. Error	t value	Pr(>|t|)
mu	0.0001290	0.0002892	0.4462246	0.6554350
ar1	0.0032466	0.0325598	0.0997119	0.9205730
omega	0.0000029	0.0000009	3.1998093	0.0013752
alpha1	0.0454413	0.0050295	9.0348775	0.0000000
beta1	0.9224490	0.0107290	85.9768476	0.0000000

The alpha and beta coefficients are highly significant. This means that there is strong persistence in volatility and of volatility clustering, meaning periods of high volatility tend to follow
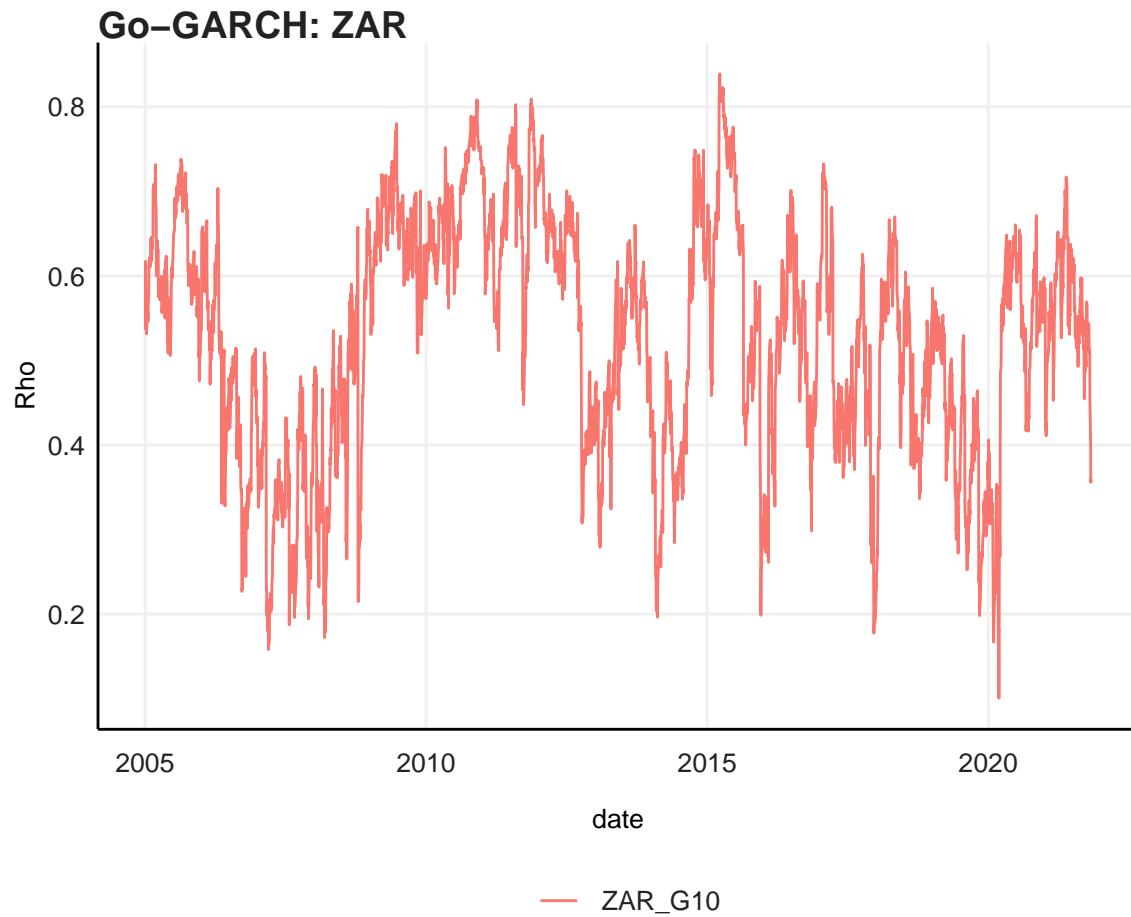
Comparison: Returns Sigma vs Sigma from Garch
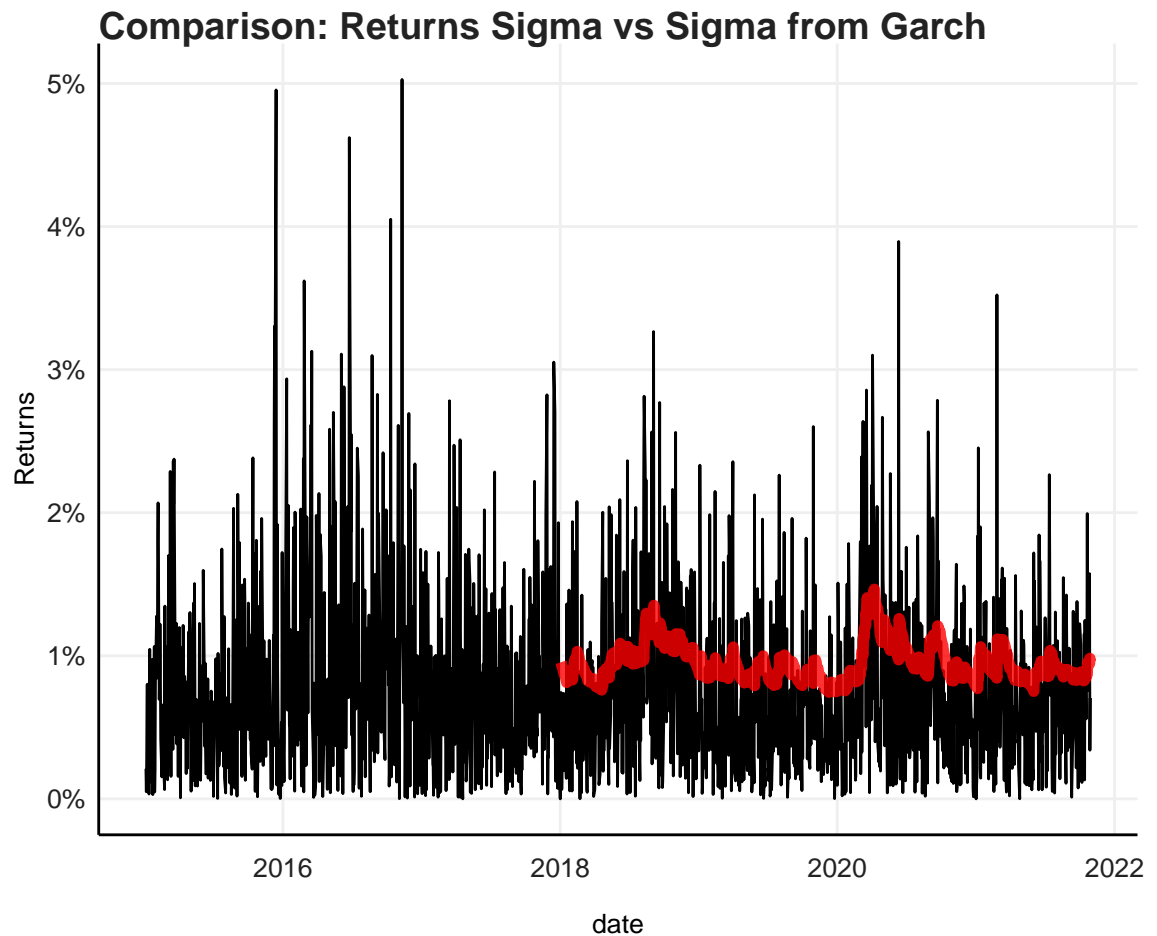
each other.

Now, we have a noise reduced measure of volatility.

Go–GARCH: ZAR

Lastly I plot the GO-GARCH's correlation between G10 currencies and the Rand. This graph now provides more evidence for how volatile the Rand is with the correleations over just 3 years ranging between 0.7 and 0.2.

References