Analysis of ZAR Volatility and Performance

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Abstract

This document provides an analysis of the recent ZAR performance. The ZAR has been among the most volatile currencies in the recent past. Here the smoothed volatility is modelled using the GARCH method. The smoothed volatility is compared to global volatility. The performance of the ZAR is also determined for different periods.

1. Introduction

The ZAR has been among the most volatile currencies in the recent past. Here the smoothed volatility is modelled using the GARCH method. The smoothed volatility is compared to global volatility. The performance of the ZAR is also determined for different periods.

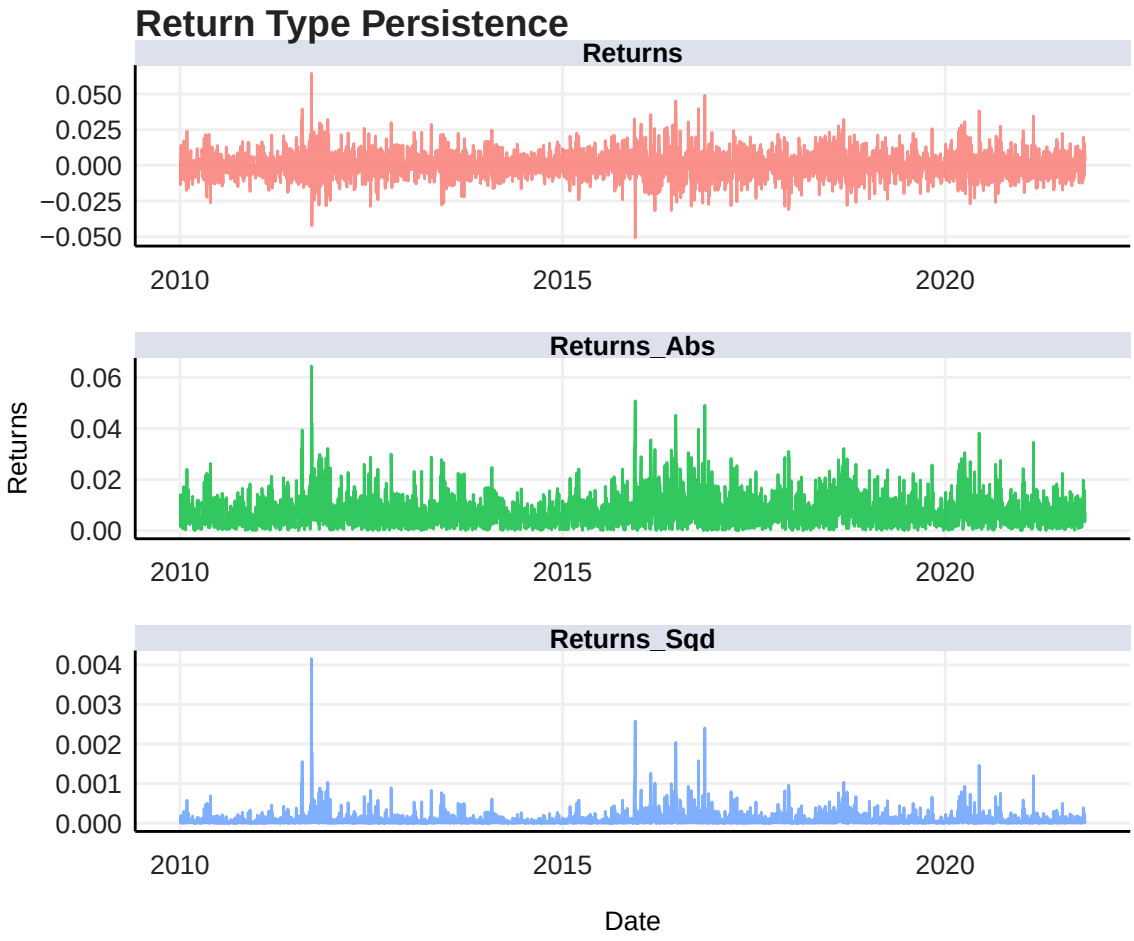
2. GARCH Model

From the Return Type Persistence plot, it is clear that there is a level of conditional heteroskedasticity. This is clear from the region of large squared returns. The ACF's of the dlog returns show limited autocorrelation in returns, but the ACF's of squared and absolute returns indicate autocorrelation. This coupled with the Box-Ljung test rejecting the hypothesis of no autocorrelation in teh squared returns indicates the need for a GARCH type model.

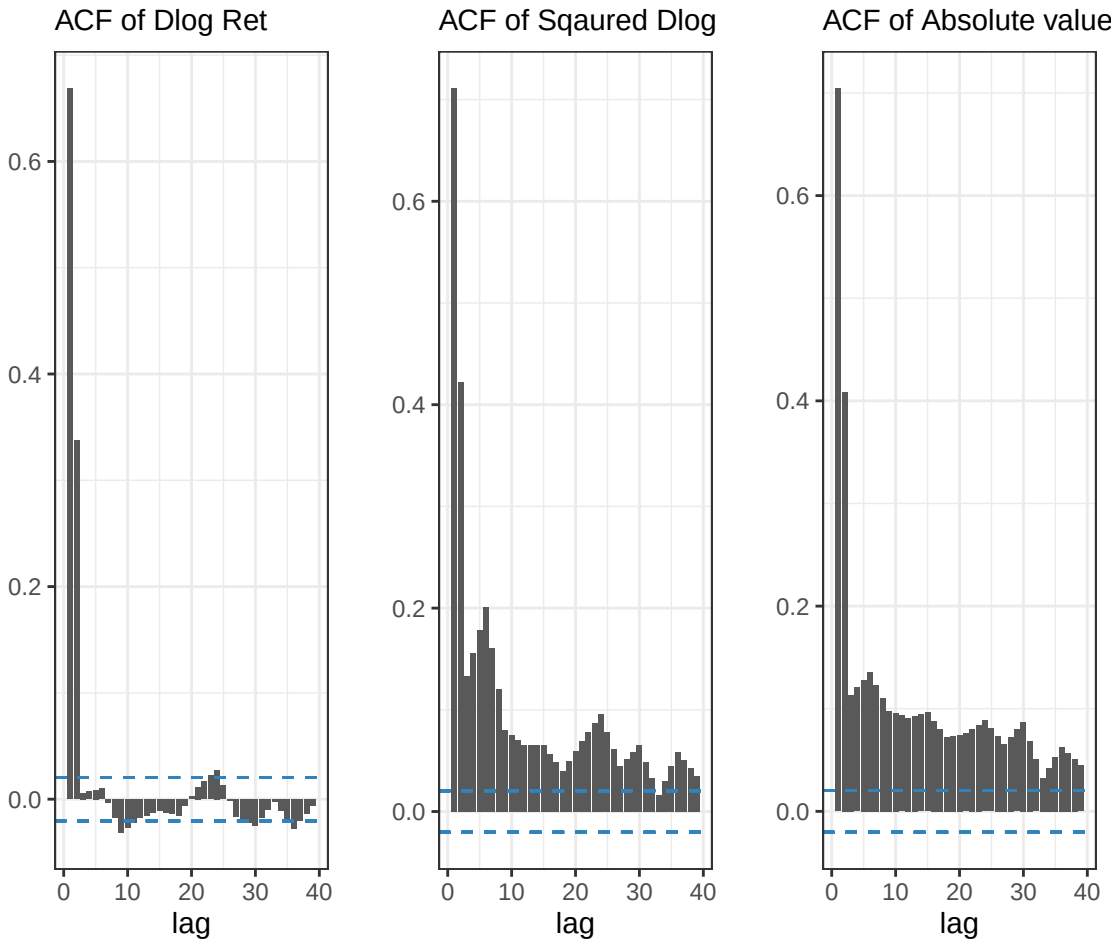
The type of GARCH model that results in the lowest AIC is the gjrGARCH specification. This allows for leverage effects. The fitted gjrGARCH model gives the output as seen in Table 2.1. The plot comparing the squared returns to the GARCH smoothed returns shows the model smoothes out the noise from the signal.

```
## $`Return Plots`
```

Email address: 20858345@sun.ac.za (Jonathan Rossouw)


Return Type Persistence
Returns
0.050
0.025
0.000
−0.025
−0.050
2010
2015
2020
Returns_Abs
0.06
0.04
0.02
0.00
Returns
2010
2015
2020
Returns_Sqd
0.004
0.003
0.002
0.001
0.000
2010
2015
2020
Date

```
##
## $`ACF Plots`
```

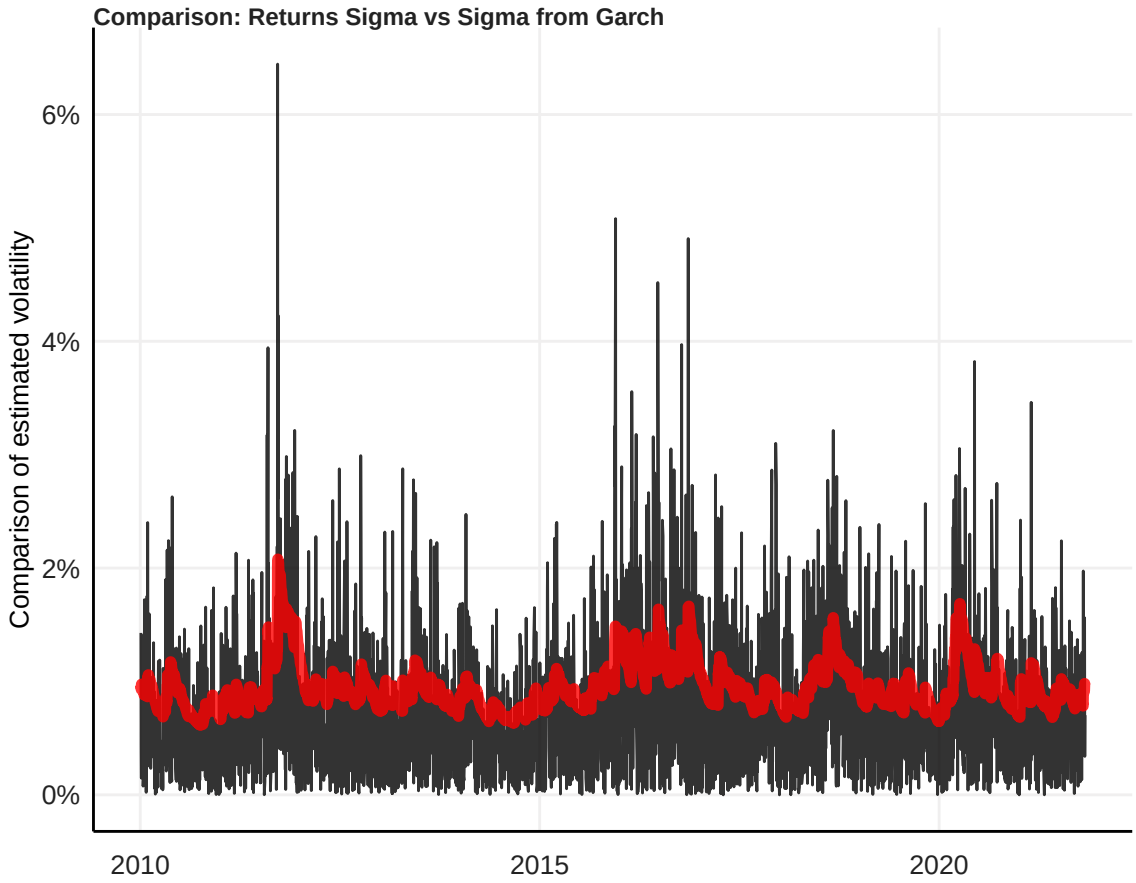



```
##
## $‘Box Statistics‘
##
##  Box-Ljung test
##
## data:  data$dlogret^2
## X-squared = 303.93, df = 12, p-value < 2.2e-16
```

```
##                   sGARCH  gjrGARCH    eGARCH    apARCH
## Akaike       -6.510600 -6.519711 -6.517530 -6.515322
## Bayes        -6.500820 -6.507975 -6.505794 -6.501630
## Shibata      -6.510605 -6.519718 -6.517537 -6.515332
## Hannan-Quinn -6.507087 -6.515495 -6.513314 -6.510404
```

Table 2.1: GARCH Coefficients

	Estimate	Std. Error	t value	Pr(>|t|)
mu	0.000	0.000	1.356	0.175
ar1	-0.007	0.018	-0.379	0.705
omega	0.000	0.000	1.688	0.091
alpha1	0.060	0.008	7.764	0.000
beta1	0.954	0.005	176.375	0.000
gamma1	-0.057	0.010	-5.538	0.000
shape	12.959	2.759	4.697	0.000



3. ZAR Vol

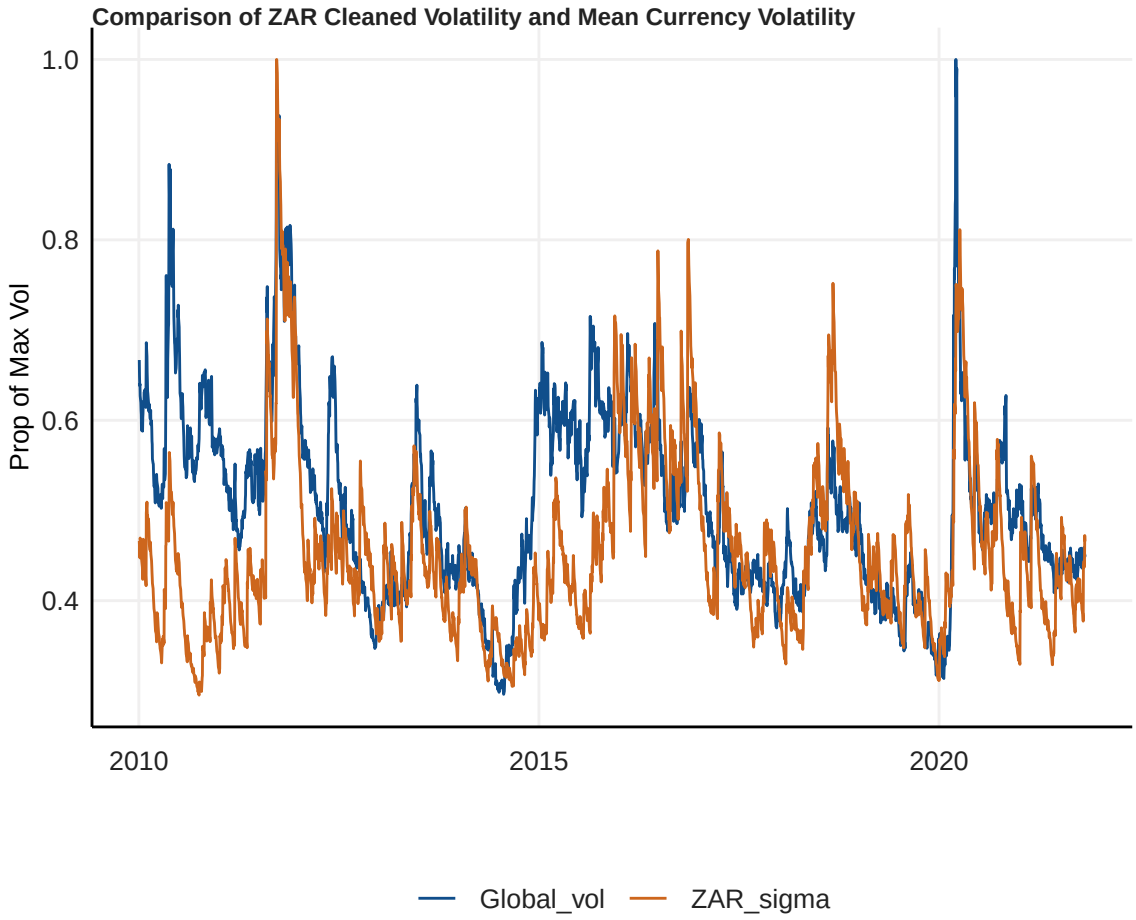
From Table 3.1, it is clear that the ZAR has been the fourth most volatile currency over the past decade.

Table 3.1: Top 10 Highest Mean Squared Returns

Name	Mean_Vol
Ghana_Cncy	0.0001712
Russia_Cncy	0.0001006
Brazil_Cncy	0.0000968
SouthAfrica_Cncy	0.0000939
Zambia_Cncy	0.0000893
Argentina_Cncy	0.0000877
Nigeria_Cncy	0.0000863
Turkey_Cncy	0.0000801
Egypt_Cncy	0.0000765
Hungary_Cncy	0.0000644

4. ZAR Vol and Global Vol

The below figure compares the smoothed volatility from the above GARCH model for the ZAR and the mean daily currency volatility index. In the beginning of the decade, the ZAR and global vol were not alined. However, since 2016, the ZAR Vol and Global Vol have moved in tandem. Thus ZAR Vol is a very clear proxy for Global Currency Vol.



5. ZAR Performance

When comparing the average performance of the ZAR during normal times compared to periods of expected higher performance. The periods concerned are: the top decile of carry trade returns, bottom decile of value strategy returns, and the top decile of Dollar returns. From Table 5.1, ZAR performance is higher during the selected periods when compared to normal periods. The performance for each specified period is the same. This indicates that the periods most likely coincide.

Table 5.1: ZAR Performance during Different Periods

Mean_Ret	Type
0.0002451	Normal
0.0002451	Carry-Trade
0.0002451	Value
0.0002451	Basket