

Question 5

Wesley James Williams^a

^aStellenbosch University, South Africa

Abstract

Currency volatility analysis using GARCH methodologies.

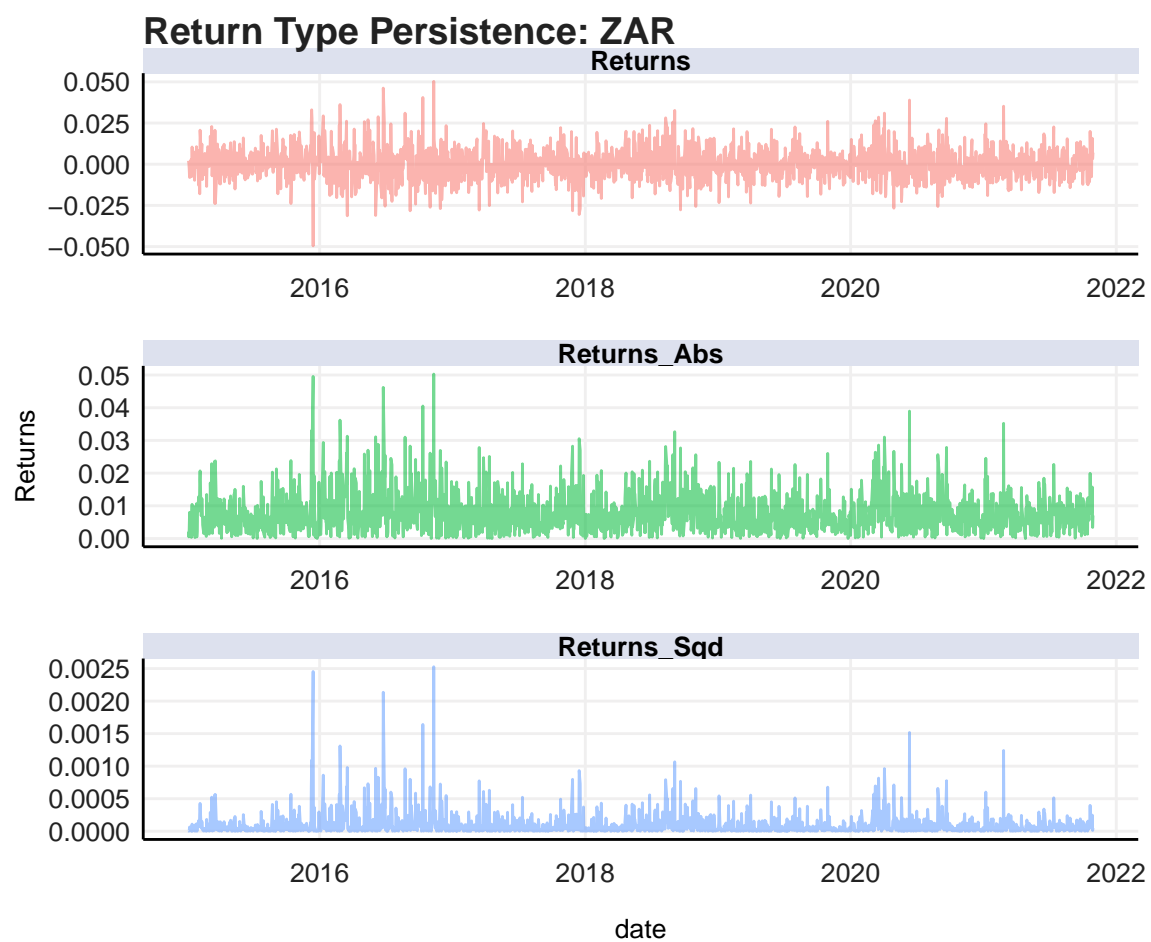
*Corresponding author: Wesley James Williams

Email address: 21691126@sun.ac.za (Wesley James Williams)

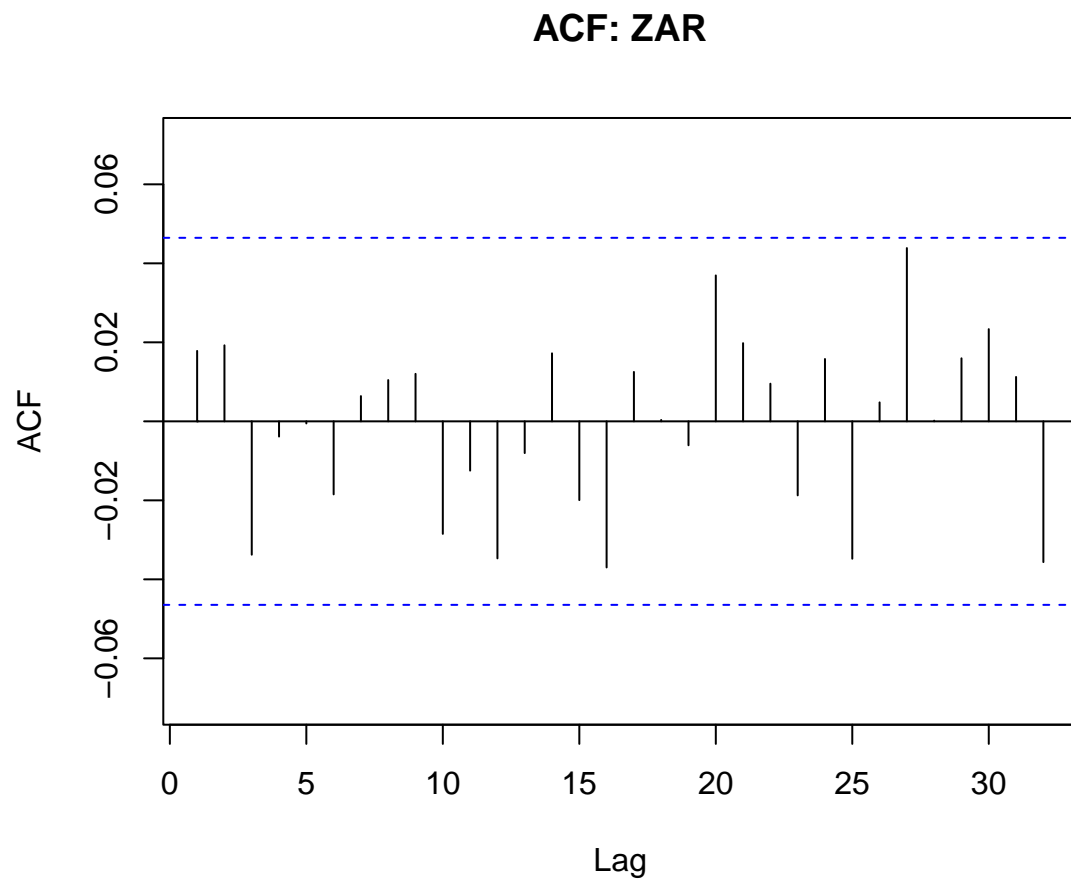
1. Volatility of the ZAR

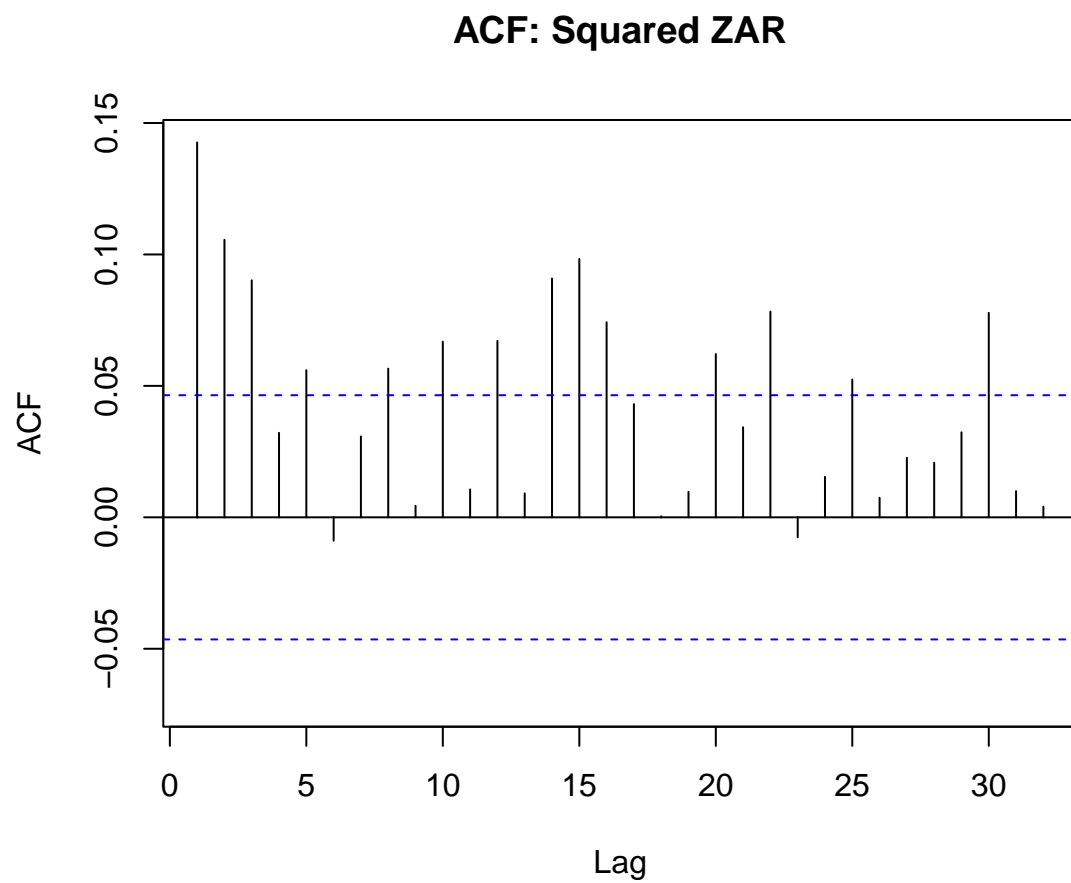
Name	avg_std_dev	rank
Ghana	0.0133703	1
Argentina	0.0119544	2
Nigeria	0.0114748	3
Egypt	0.0111624	4
Zambia	0.0108368	5
Brazil	0.0107192	6
Turkey	0.0102997	7
SouthAfrica	0.0101896	8
Russia	0.0098690	9
Columbia	0.0084828	10
Mexico	0.0083886	11
Norway	0.0073514	12
Chile	0.0067539	13
NZ_Inv	0.0064288	14
Hungary	0.0063517	15
Poland	0.0062783	16
Australia_Inv	0.0061457	17
UK_Inv	0.0060173	18
Sweden	0.0059233	19
Czech	0.0057921	20

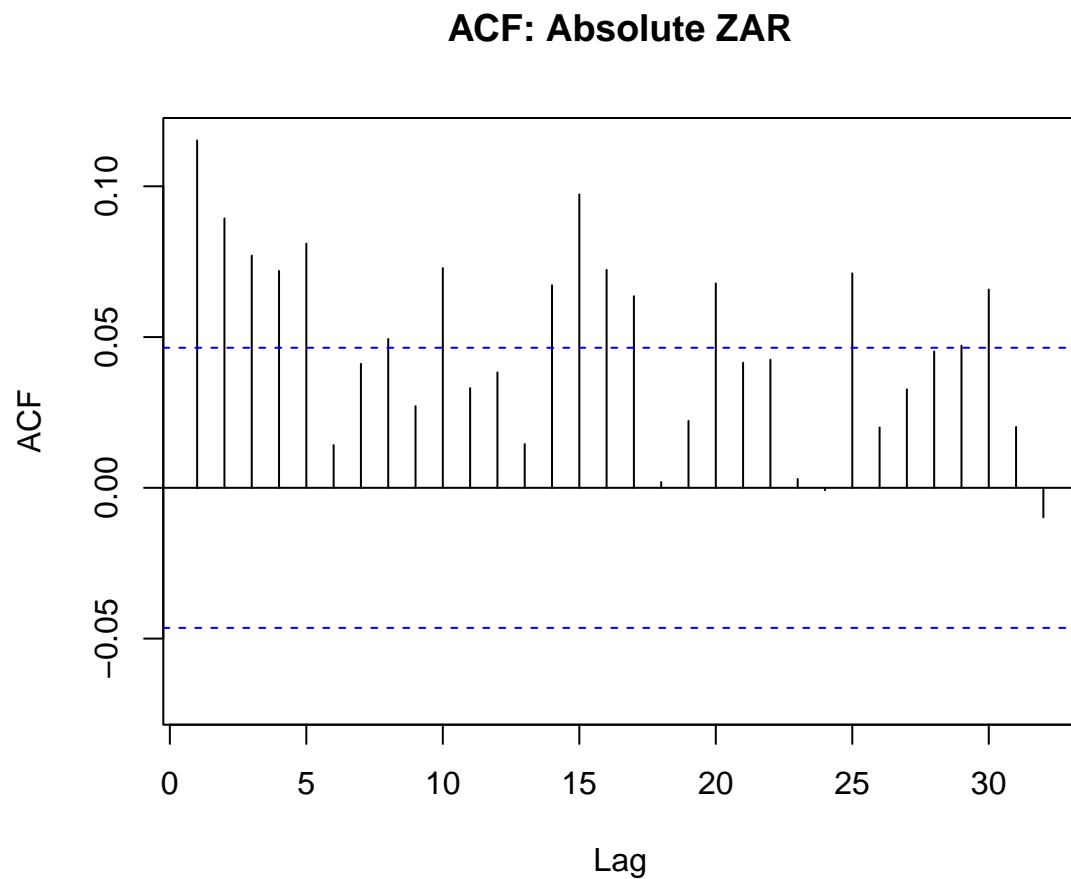
The table above ranks countries by their currencies average volatility, measured by the average scaled dlog returns standard deviation, since 2018 and it shows that the South African ZAR has been the 8th most volatile currency. But this may be due to noise.



The figure above shows clear signs of both first and second order persistence. To verify this I plot the ACFs.





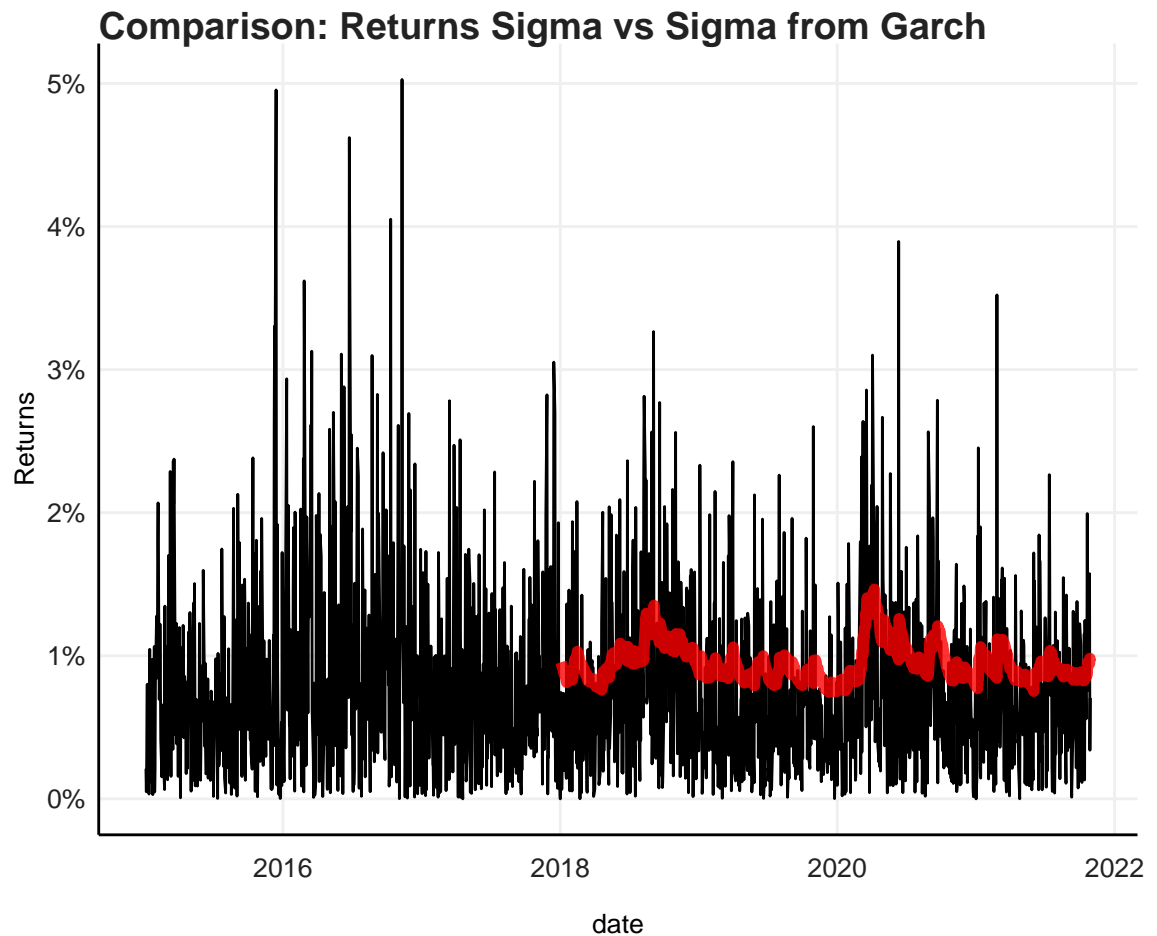


```
##  
## Box-Ljung test  
##  
## data:  coredata(zar_rts^2)  
## X-squared = 101.98, df = 12, p-value = 2.22e-16
```

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

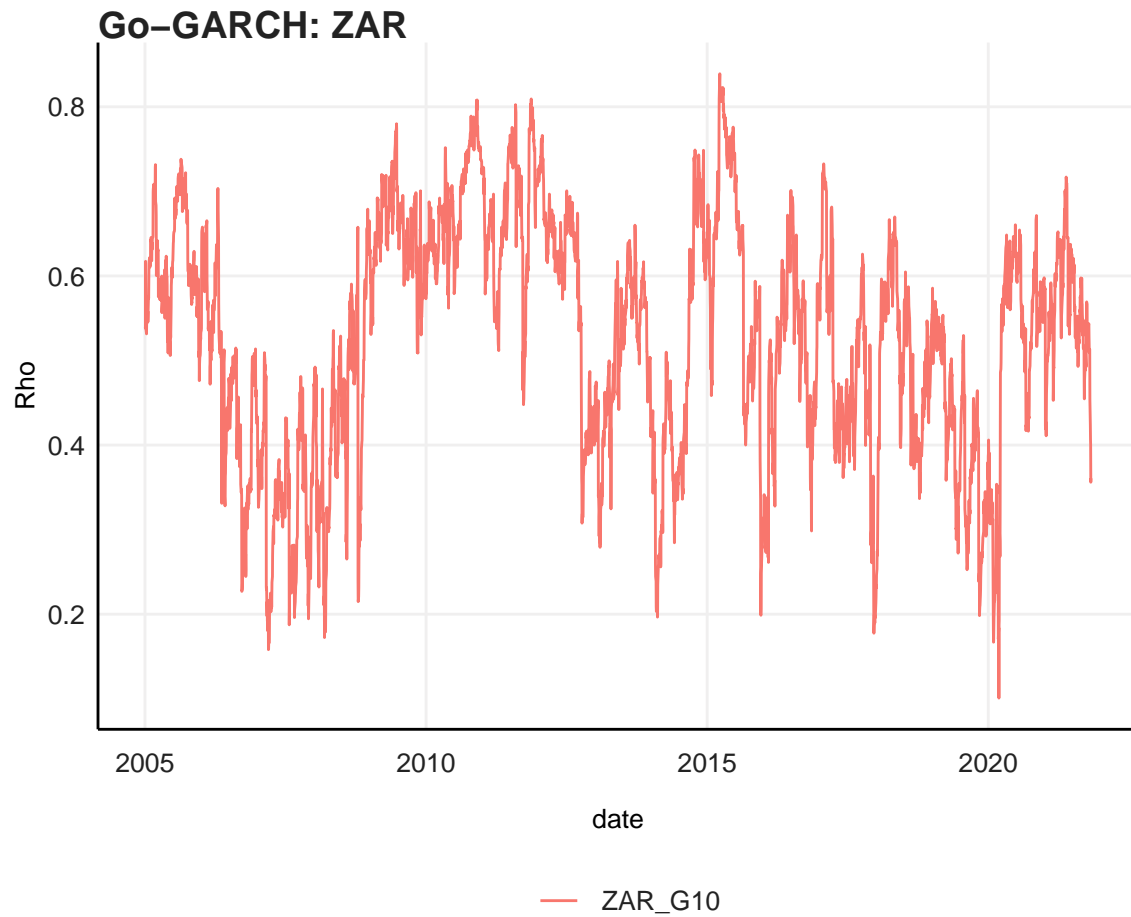
The alpha and beta coefficients are highly significant. This means that there is strong persistence in volatility and of volatility clustering, meaning periods of high volatility tend to follow



each other.

Now, we have a noise reduced measure of volatility.

1.1. GO-GARCH



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 correlations over just 3 years ranging between 0.7 and 0.2.

References