Question 2

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1. Replication of Study

As can be seen in figure 2.1, I have recreated the graphic from the study. The distributions of returns will be shown separately, in figure 2.2. The graphic shows the negative relationship between the Rand/USD exchange rate and the returns of a portfolio which has a 60/40 equities to bonds ratio, while maintaining a 70/30 local to foreign ratio. This portfolio does not in and of itself include the rand. The plot is a ggplot object with a linear line of best fit estimated and standard errors included. As you can see, the best case scenario still only occurs around 9.31% of the time, which is similar to the finding in the article. It is much more likely that the portfolio returns will be negative and the Rand/USD positive.

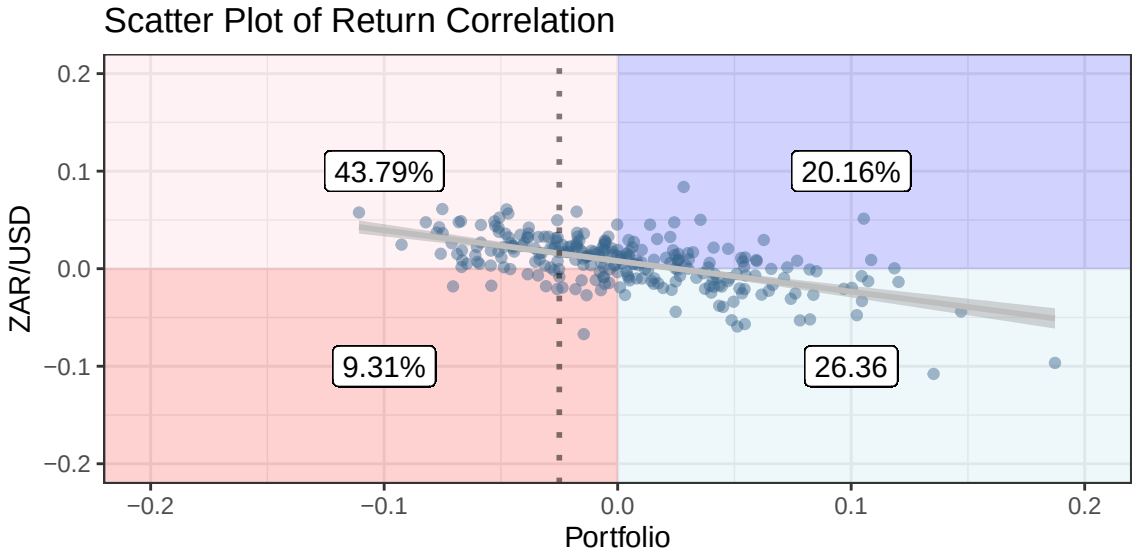

Figure 1.1

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In figure 2.2, we see the distribution of returns for the two funds or assets.This is also a ggplot object, and no functional transformation was performed on the returns (such as log). The Rand has substantially more extreme values than the weighted portfolio. Though the hypothesis is that a portfolio of a negatively correlated (and volatile) asset into a portfolio can actually result in a volatility which is less than the sum of its parts.

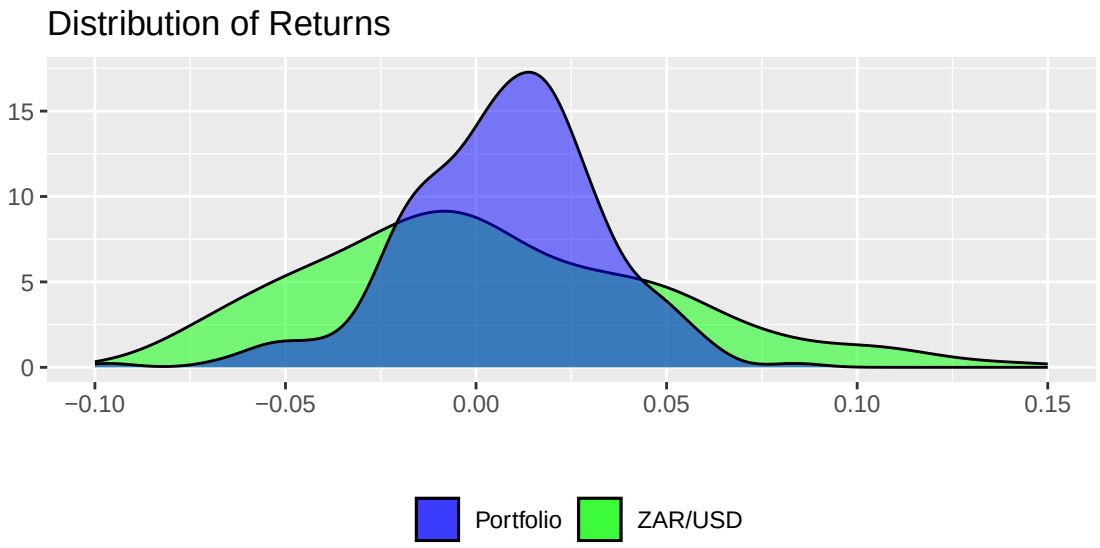

Figure 1.2

Below I once again used the rolling standard deviation methodology described in our tutorials/practicals. For this, I constructed a weighted portfolio once more, except I used the PerformanceAnalytics::Return.portfolio() function, re-balancing quarterly. For the "including Rand" standard deviation I simply used a weighted average of the returns of the re-balancing portfolio and the returns of the Rand, with a 90/10 split. Figure 2.3 shows that including the rand in the portfolio reduces the rolling volatility of the portfolio, even if it is only 10% exposed to the Rand's volatility.

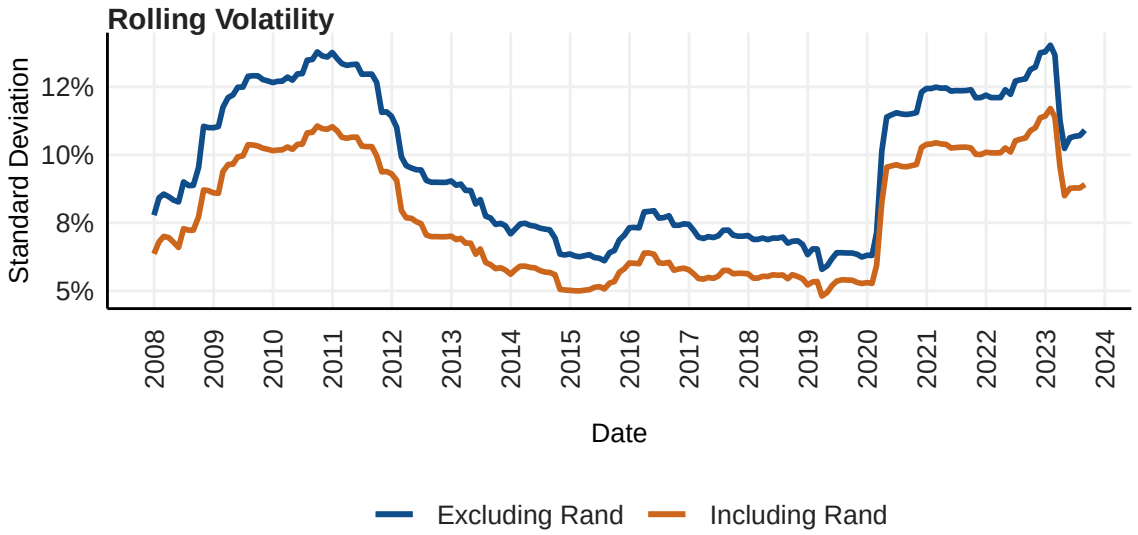
Rolling Volatility
Standard Deviation
12%
10%
8%
5%
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Date
Excluding Rand
Including Rand

Figure 1.3