ANALYSING THE VOLATILITY OF LARGE, MID AND SMALL CAP SHARES IN SOUTH AFRICA

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Analysing the volatility of large, mid and small cap shares in South Africa

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1. Introduction

Generally one would think that small cap stocks represent companies that have less established business models and less predictable revenue streams. This might lead one to believe that the prices of such stocks fluctuate to a greater degree than a more established, larger company. This would result in a less predictable return profile and hence, greater risk. The aim of this paper is to asses whether small cap stocks have a higher or lower level of volatility than large and mid cap stocks in South Africa.

Three separate indexes (Large, Mid and Small) were established in order to conduct the analysis over the 2005 to 2022 period. The Global Financial Crisis (GFC) and the COVID-19 pandemic had obvious consequences for the three indexes. The objective was both to determine which of the indexes were most affected by these times of crisis as well as to determine which of the indexes recovered fastest. It is found that the composition and the degree of correlation of an index has profound consequences for the performance of the respective index. As will be divulged, the Small Cap Index generated the lowest level of volatility when compared to the Large Cap and Mid Cap Indexes. The Small Cap Index's returns, standard deviations and degree of correlation all contributed to the resultant observation. The low degree of correlation of the Small Cap Index allowed for it be be well-diversified and thus best suited to weather an economic crisis in South Africa.

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Contributions:

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2. Index Analysis

The analysis of volatility is based on three indexes of the Johannesburg Securities Exchange (JSE). Data is attained by filtering out the FTSE All Share Index (ALSI). The large cap index is based on the FTSE/JSE Top 40 Index (J200), the mid cap index is based on the FTSE/JSE Mid Cap Index (J201) and the small cap index is based on the FTSE/JSE Small Cap Index (J202). The derived returns for each of the separate indexes are calculated as the product of a stocks daily return and the assigned weight in the respective index. For the large and small cap indexes, data from 2005 to 2022 is available. Unfortunately for the mid cap index, data is only available from 2016 onward.

2.1. Drawdowns

A drawdown chart is used to illustrate the worst periods of time for a portfolio under analysis. The graphs are important for measuring the historical risk of an investment as they display the peak-to-trough decline in each of the indexes value (Geboers, Depaire & Annaert, 2022). A drawdown chart is essentially a measure of downside volatility.

The large cap index in Figure2.1 experienced its most drastic drawdown between 2008 and 2009 but most drawdowns were in the range of between 0 and -0.2. This is not surprising as the large cap index has a relatively large international exposure and hence, the aftermath of the Global Financial Crisis (GFC) would have been heavy hitting on the returns of the index. The next major drawdown occured in the period during the COVID-19 pandemic. The large cap index is thus highly reactive to times of economic crisis. This is no surprise.

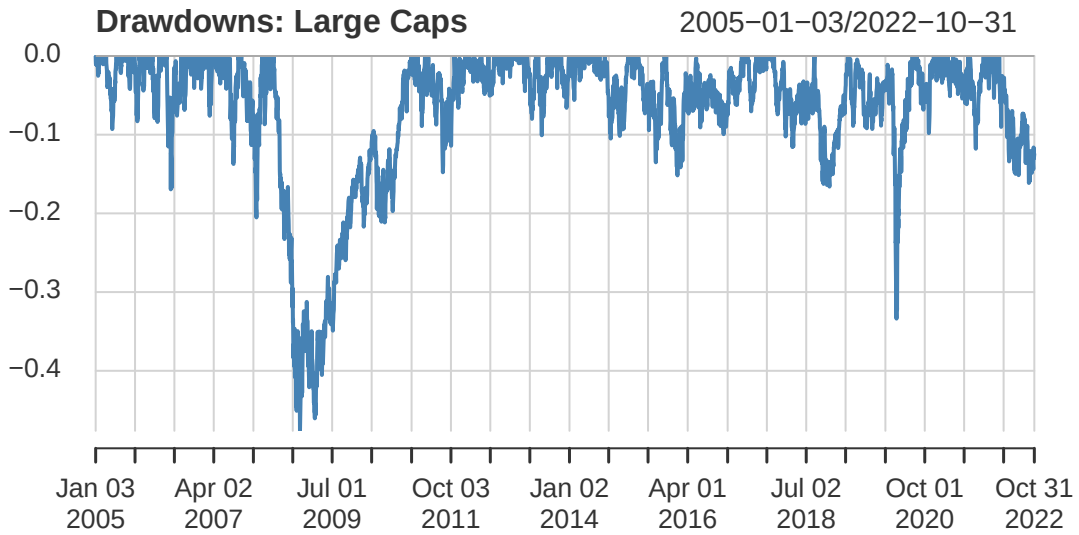

Figure 2.1: Large Cap drawdown chart

It is unfortunate that data could not be obtained for the mid cap index for the full sample period. Most drawdowns for this short sample of the mid cap index were in the range of between 0 and -0.2. During the COVID-19 pandemic, the mid cap index responded very similarly to the large cap index. I attribute this common drawdown to the fact that the pandemic was not selective on which stocks within an index would be more or less affected. The pandemic was a global crisis and had nothing to do with an index's amount of international exposure. The GFC would have had more of an impact on an index with high international exposure compared to one with lower international exposure.

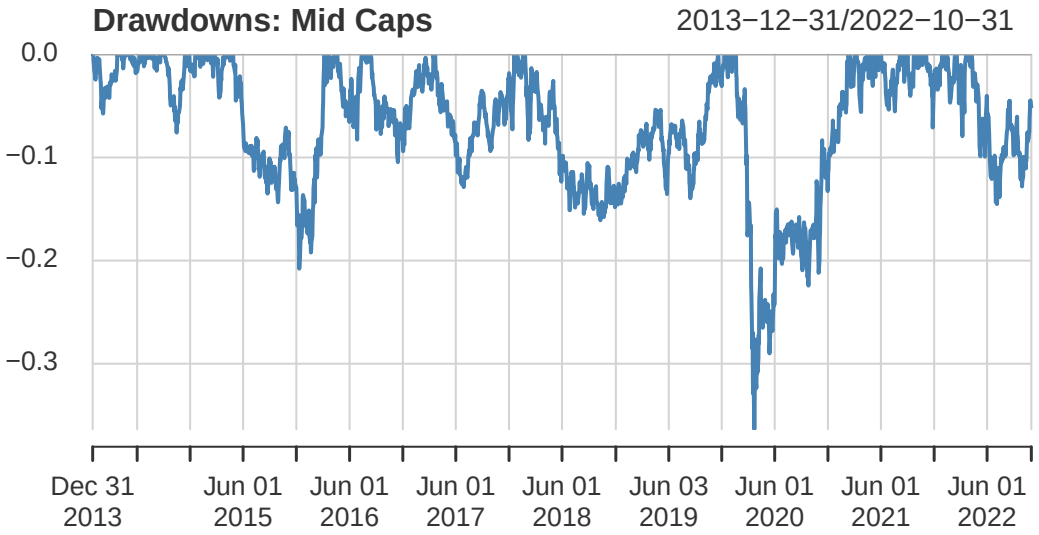

Figure 2.2: Mid Cap drawdown chart

As illustrated in Figure 2.3, the max drawdown for the small cap index occurred in the aftermath of the GFC. This drawdown was of a smaller magnitude and lasted for a shorter period when compared to the drawdown of the large cap index for the same period. The small cap index was not immune to the effects of the COVID-19 pandemic and so experienced a drawdown of a similar magnitude to both the large and mid cap indexes.

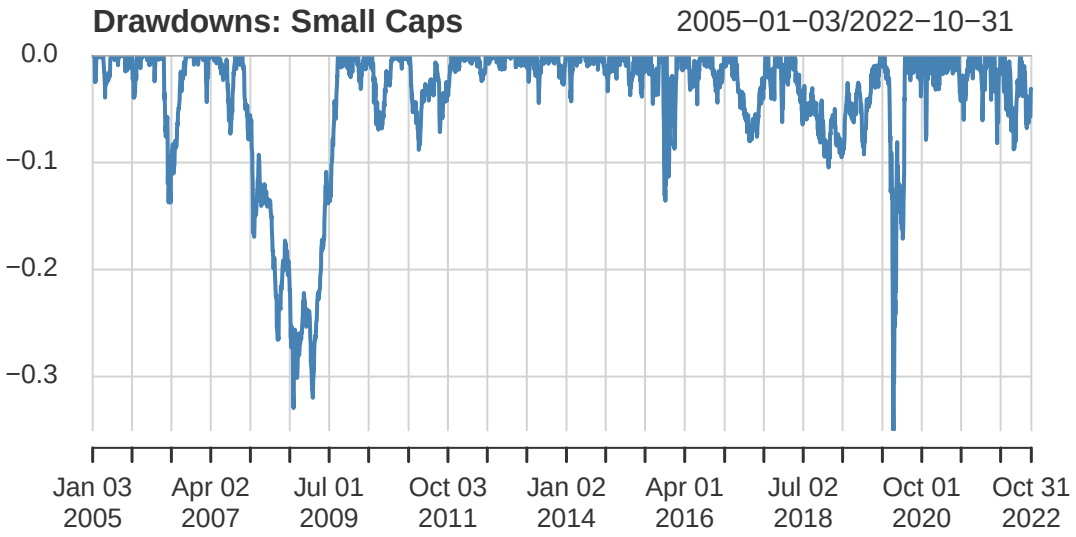

Figure 2.3: Small Cap drawdown chart

2.2. Sector weightings

Table 2.1 below provides a depiction of the mean of daily returns for each sector over the entire period. The calculation was based solely on a stocks (within a certain sector) return and did not account for any weighting within an index. The 'Industrials' sector clearly generates, on average, the highest mean returns by a large magnitude. The 'Financials' sector generated the second highest mean daily returns while the 'Property' and 'Resources' sectors trailed far behind. The natural goal of an index would be to optimise its return profile. This would involve choosing a group of stocks that generate high returns but are not correlated (or have a low correlation). Hedging against downside returns could even be considered as important as searching for upside returns.

Sector	Mean
Financials	0.16530
Industrials	1.342
Property	0.009539
Resources	0.07961

Table 2.1: Mean daily returns

As can be seen in 2.4, the large cap index has historically neglected the 'Property' sector and has been dominated mostly by the 'Industrial' and 'Resource' sectors. In earlier periods of the sample (2005 to 2012) 'Resources' dominated 'Industrials' but the opposite became true in later periods. The

'Financials' sector seems to have maintained a relatively constant weighting in the large cap index. The weightings in the later portion of the period do not sum to one. This is the result of a few mid cap stocks being filtered out of the large cap index yet they formed part of the FTSE/JSE Top 40 Index.

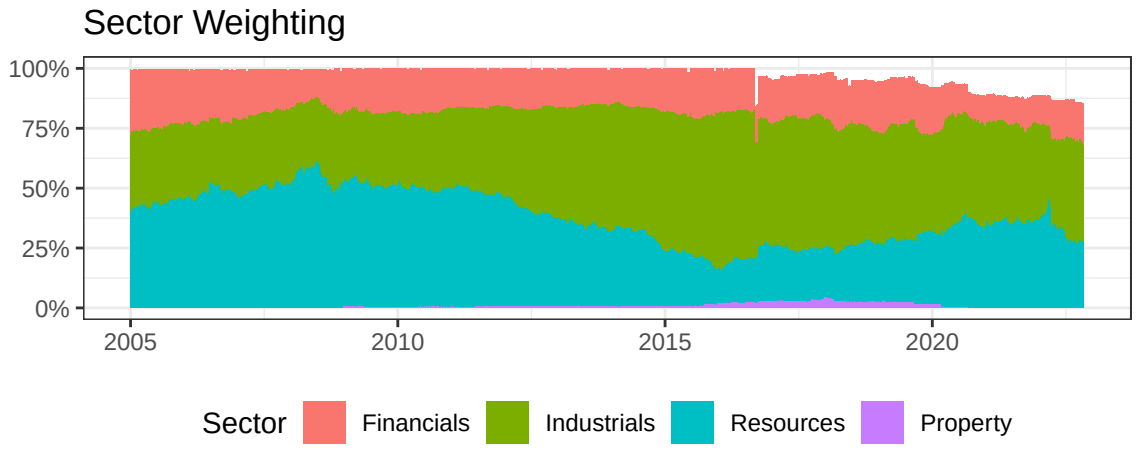

Figure 2.4: Sector weights for Large Cap index

The 'Industrials' sector also dominated the weighting of the mid cap index. Figure 2.5 displays a consistent domination of the 'Industrials' sector for the index. The 'Financial' sector was assigned the second highest weighting in the latter portion of the period at hand, surpassing the early dominance of the 'Resources' and 'Property' sector. The mid cap index assigned a noticeably greater weight to the 'Property' sector and a lower weight to the 'Resources' sector when compared to the large cap index for the latter portion of the full period under analysis.

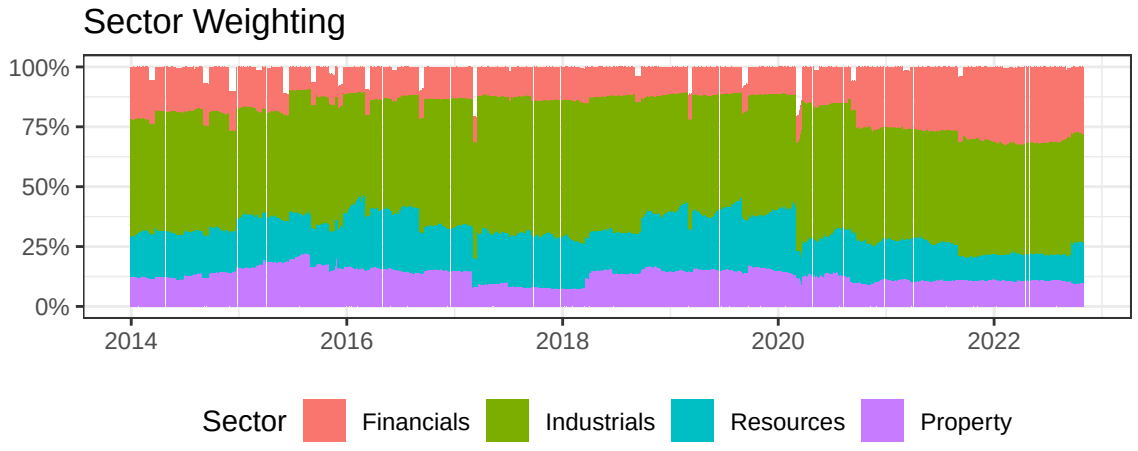

Figure 2.5: Sector weights for Mid Cap index

When compared to the large and mid cap indexes, the small cap index placed the lowest weighting on the 'Financial' sector. The 'Property' sector in the small cap index was allocated the most weight out of all the indexes from around 2013 to 2022. The 'Resources' sector was not favoured and was assigned the smallest weighting in the small cap index for most of the period.
The 'Industrials' sector once again dominated the weighting of the index, with approximately 50% of the small cap index being dominated by the sector for the full period.

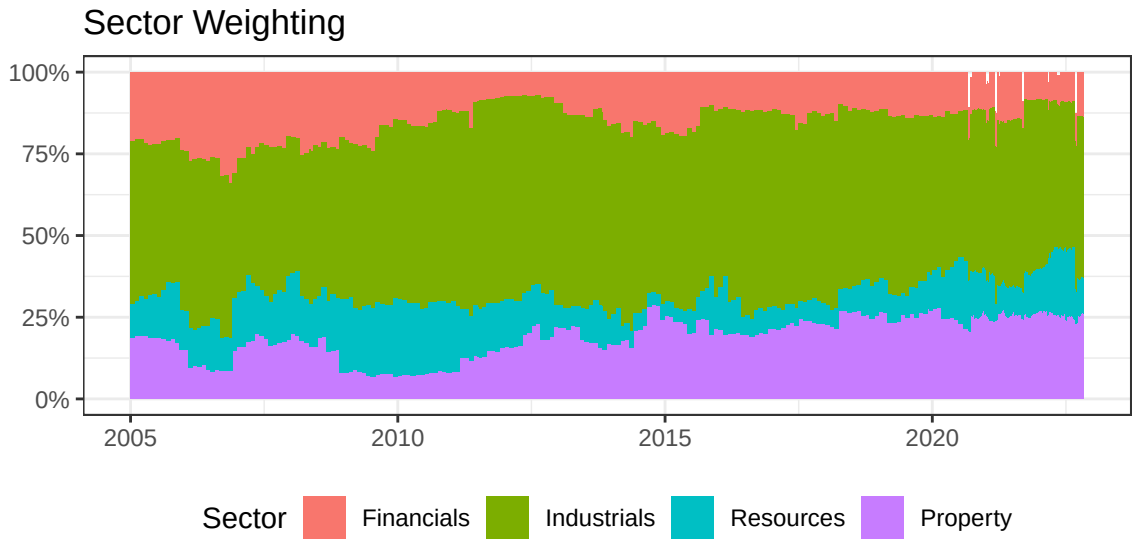

Figure 2.6: Sector weights for Small Cap index

3. Annualised returns

The idea behind annualising returns is to be able to make direct comparisons of returns across different time periods. A rolling annualised return calculation was conducted in order to provide a means for actual performance comparison for the indexes at hand. As can be seen in Figure 3.1 below, the small cap index consistently outperforms both the large and mid cap indexes. An elementary analysis based on the figure of how large and small cap shares responded to the aftermath of the Global Financial Crisis of 2007/2008 yields interesting results. The small cap index seems to have had enjoyed increasingly positive returns subsequent to 2009 which may be due to the fact that the index had a low international exposure. This point is reaffirmed by Figures 2.1 and 2.3 in that the drawdown of the large cap index was more prolonged than the small cap drawdown even though the magnitude of drawdowns were similar. Although the returns for the large cap index never turned negative, the 'level of positivity' of returns diminished subsequent to the crisis. The annualised returns for the large and small indexes were most similar between 2013 and 2015.

The mid cap index outperformed the large cap index from 2016 to approximately half way through

2020. Thereafter, the large cap index outperformed the mid cap index. Thus, a closer look at the pandemic period (2020 - 2022) seemed necessary. The particular point of interest is when the large and mid cap return lines intersected. Figures 2.1 and 2.2 provide insight on how the index compositions changed during this pandemic period. The large cap index assigned a greater weight to the 'Resources' sector, kept the weighting of the 'Industrials' sector relatively constant and down-weighted both the 'Financials' and the 'Property' sectors. The mid cap index , on the other hand, assigned a greater weight to the 'Financials' sector and down-weighted the other three sectors. The 'Financial' sector in South Africa absorbed heavy blows during and subsequent to the pandemic while the 'Resources' sector experienced a less dramatic downfall. This weighting discrepancy/mistake, as I see it, resulted in the unsatisfactory performance of the mid cap index. The small cap index assigned weights similarly to the large cap index with the exception of an increased weighting for the 'Property' sector as opposed to a decreased one.

It is important to note that the small cap index consistently outperformed both the large and mid cap indexes throughout the period of analysis.

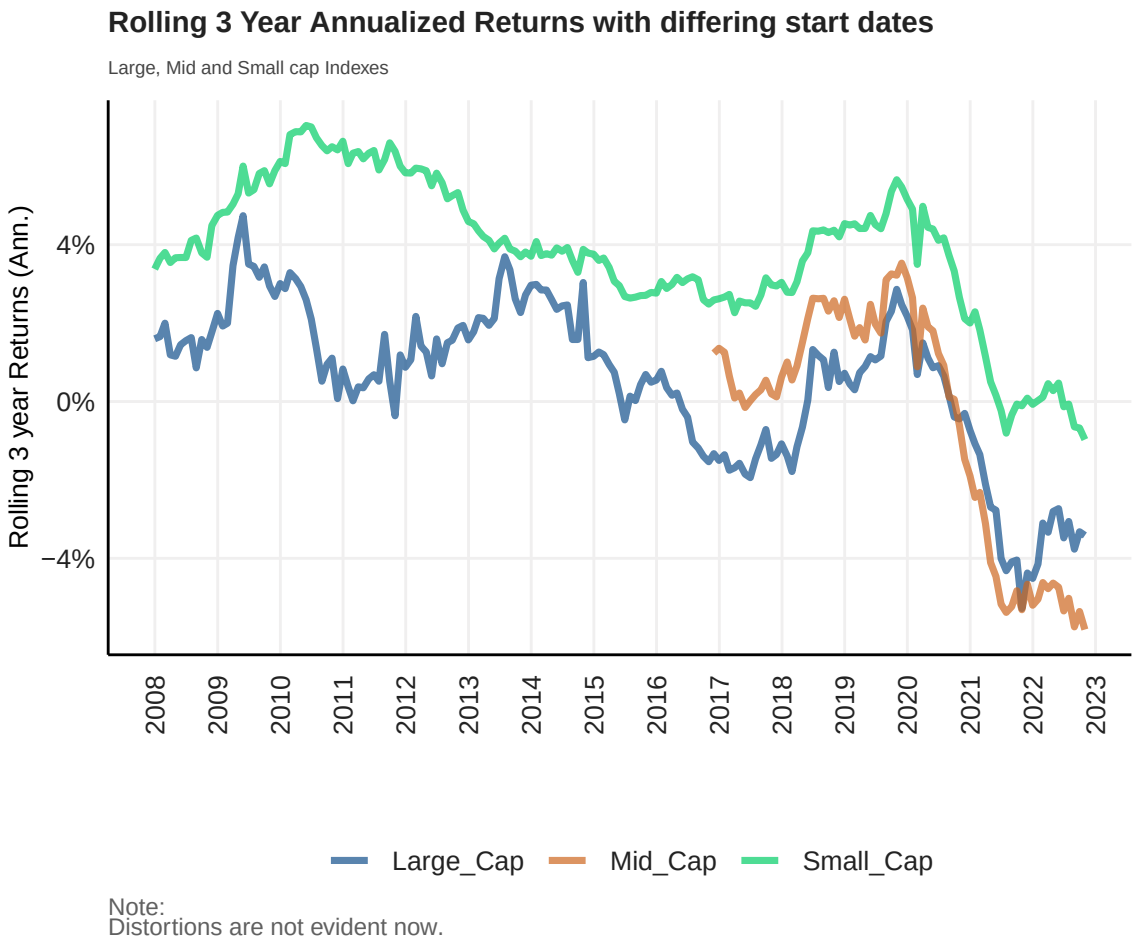

Figure 3.1: Rolling Annualised Returns of the Indexes

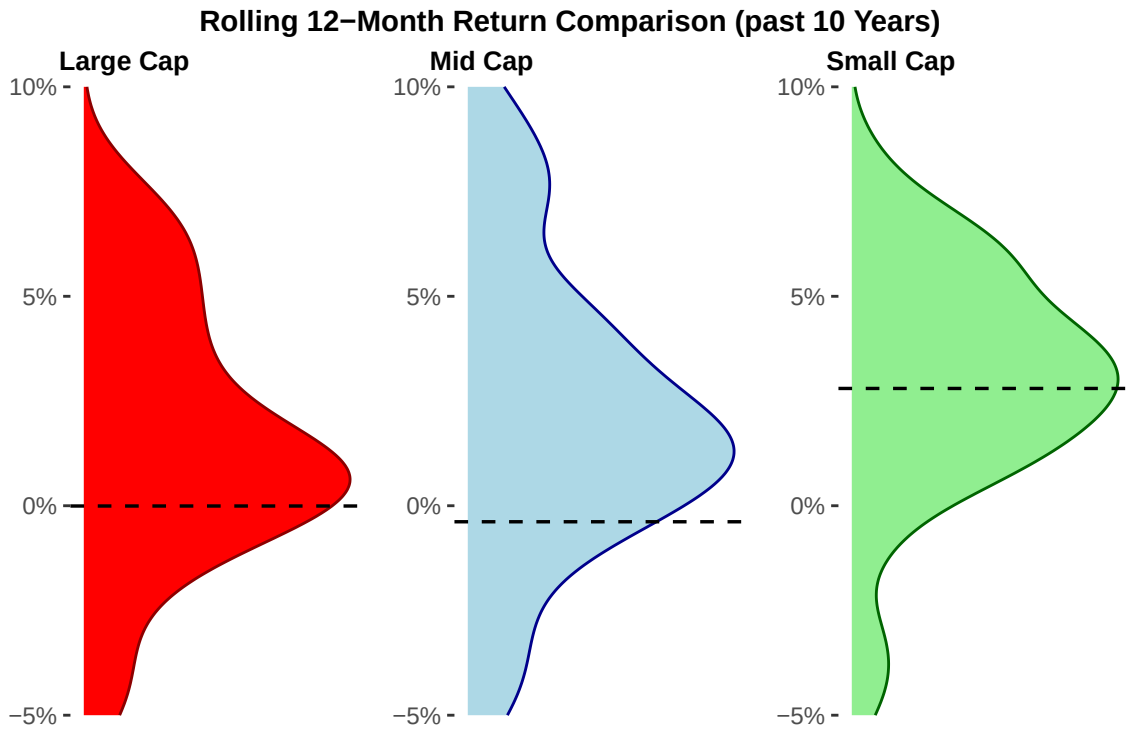

Figure 3.2: Rolling 12-Month Returns Comparison (past 10 Years)

Both the Mid- and Small Cap indexes provide high potential upside returns. The horizontal lines running through each graph in Figure 3.2 represent the respective means of the rolling 12-month returns over the past 10 years. The Small Cap Index's mean return is significantly higher than both the Mid Cap Index and Large Cap Index mean returns. Although the Mid Cap Index mean return is below the 0-line, most returns are distributed above the 0-line. There is thus a higher likelihood for upside returns than downside ones.

The return distribution of the Small Cap Index, in particular, is significantly more skewed to positive returns than the other indexes. It thus provides the greatest potential for upside gains.

4. Rolling Standard deviation

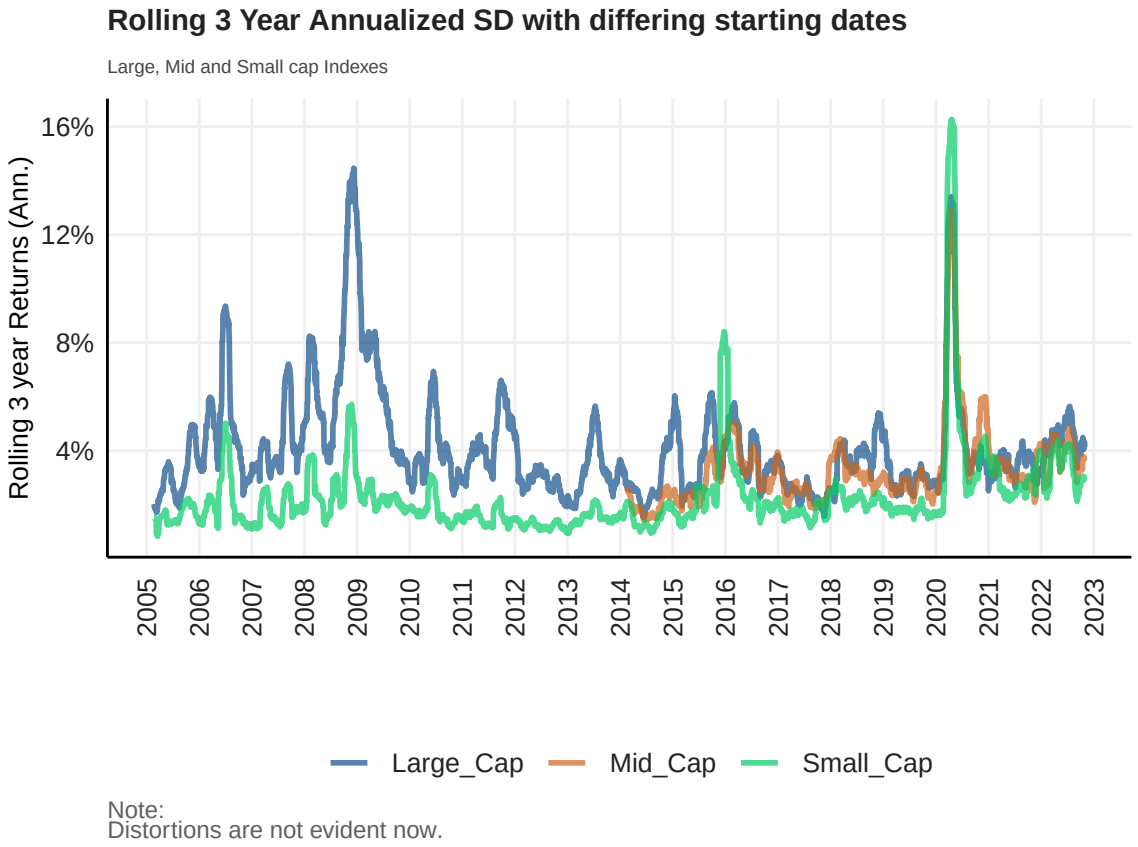

Figure 4.1: Rolling Annualised Standard Deviation of the Indexes

Standard deviation in this analysis is a used as a measure of risk. Returns for each index are annualised so that standard deviation can be compared over different time periods. It is apparent from Figure 4.1 that between 2005 and 2015 the Large Cap Index is on average epitomised by a larger standard deviation than the Small Cap Index. It should now be of no surprise that the standard deviation of the Large Cap Index spikes, as a result of the GFC, in 2009 more than that of the Small Cap Index. The standard deviation of all indexes spike in 2016 and halfway through 2020. The spike in the Small Cap Index, however, exceeds the standard deviation spikes of both the Large Cap and Mid Cap indexes during these time stamps. Following the 2020 spike, the Small Cap Index quickly reverts back to pre-pandemic levels of standard deviation while the Mid Cap and Large Cap Indexes take a little longer to revert back. By the end of the period of analysis, the standard deviations of the three indexes are reasonably close together with the Small Cap Index having the lowest and the Large Cap Index having the highest standard deviations.

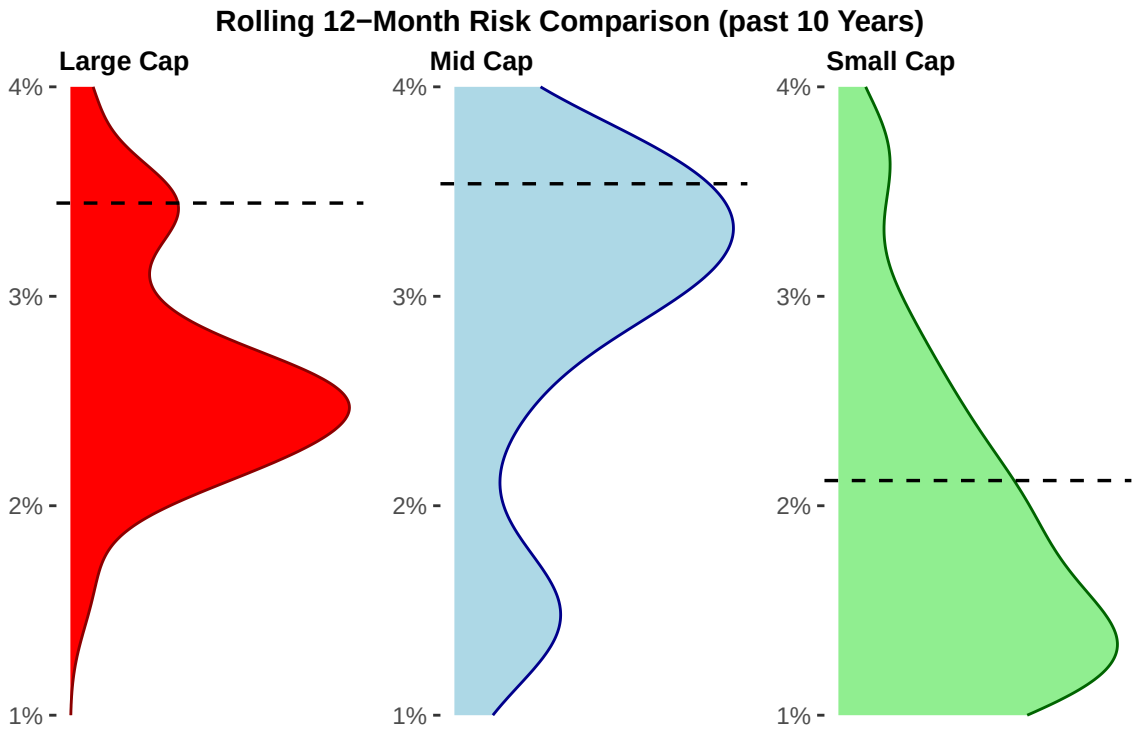

Figure 4.2: Rolling 12-month Risk Comparison (past 10 Years)

The high potential for upside returns in the Small Cap Index does not necessarily come at a higher portfolio risk. As can be seen in Figure 4.2, the distribution of materialized risk over time shows that the Small Cap Index delivered lower aggregate volatility on the whole. The stability of the index can be attributed to the lower relative international exposure compared to both the Large and Mid Cap Indexes.

The Mid Cap Index seems to have delivered the highest aggregate volatility on the whole. This result is likely to have been influenced by the lack of data. Although the Large Cap Index's distribution of materialized risk over time is concentrated between the 2% and 3% regions, its mean standard deviation is roughly equal to the mean standard deviation of the Mid Cap Index.

	Standard deviation
Large cap	0.01298498
Mid cap	0.01039368
Small cap	0.00801369

Table 4.1: Standard deviation

Table 4.1 displays the overall standard deviation for each index over their respective sample periods. The Large Cap Index is associated with the highest standard deviation and as such, the highest level of risk.

	Large cap	Mid cap	Small cap
Volatility skewness	1.069731	0.9739739	1.379238

Table 4.2: Volatility skewness

Table 4.2 displays a measure of volatility skewness. It is a ratio of upside variance to downside variance.

5. Correlation

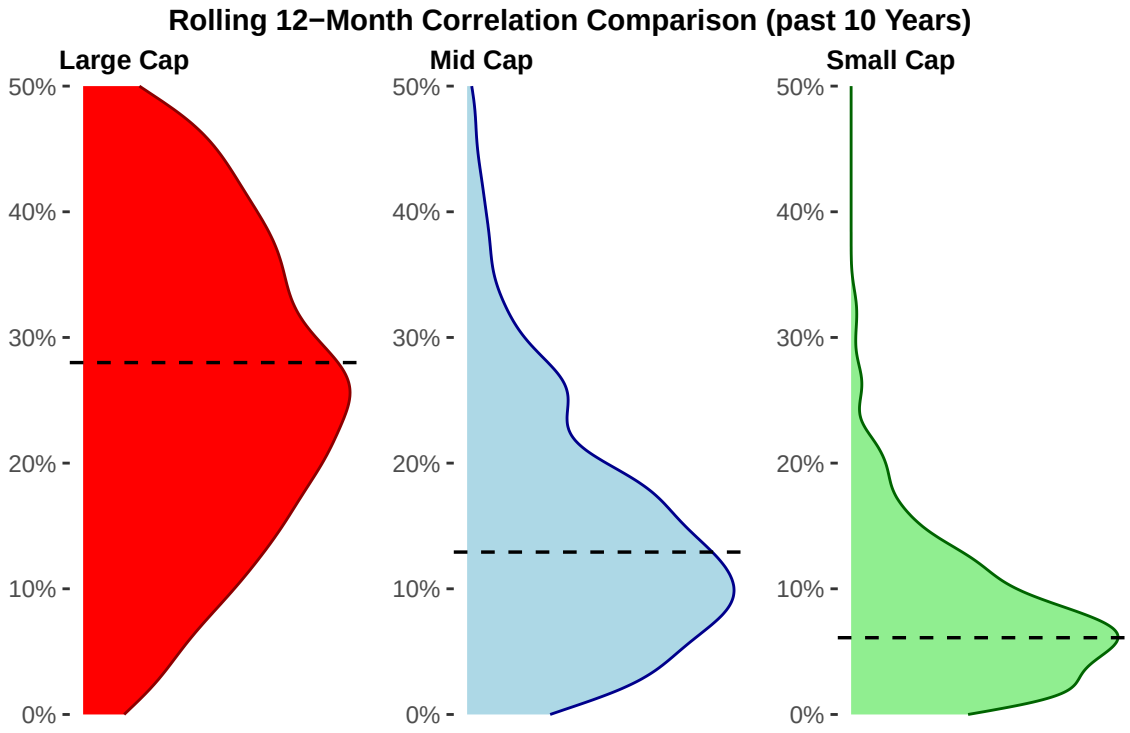

Figure 5.1: Rolling Correlation Comparison of the Indexes

Figure 5.1 shows the degree to which stocks within each of the Large, Mid and Small Cap indexes are correlated. The correlations are measured on a rolling 12-month basis, with the distributions showing the extent to which correlation varies in each.

Within the Mid and Small Cap Indexes, individual correlations are lower. So, in addition to the high potential upside returns and lower associated risk, the Small Cap Index also provides increased diversification. Although the Mid Cap Index could be regarded as relatively risky, it is more diversified than the Large Cap Index. This associated risk of the Mid Cap Index thus has to be derived from somewhere other than correlation between individual stocks within the index.

The Large Cap Index has the highest degree of correlation between its constituent stocks. The Large Cap Index is dominated by stocks that have a high degree of international exposure. Changes in global conditions and economic activity affect these stocks directly and thus lead to a higher level of correlation. A high degree of correlation negatively impacts any chances of diversification.

6. Conclusion

The aim of this paper was to compare the differing levels of volatility in large, mid and small cap stocks. The Small Cap Index was not immune to the consequences of the GFC of 2007/2008 but was not nearly as adversely affected when compared to the Large Cap Index. The high degree of international exposure and hence, high degree of correlation did not allow for the Large Cap Index to be sufficiently diversified to combat the effects of the GFC. The pandemic of 2020/2021 had a more all-encompassing consequence for stocks as a whole in South Africa. The consequences were not isolated to a few sectors of the economy but rather they adversely impacted most sectors. The lower degree of correlation of both the Small and Mid Cap Indexes assisted these indexes during this time. The composition of the Mid Cap Index did not, however, do the annualised return of the index any favours. The Large Cap Index was better composed and so bounced back better than the Mid Cap Index did.

The Small Cap Index has the greatest potential for upside returns, has the lowest associated risk and has the lowest degree of correlation. The return profile of the index was thus able to be optimised via diversification. It can therefore be said with confidence that the Small Cap Index is the most stable in South Africa.

References

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