Time-varying Correlation of South African Property Stocks (REITs) and the JSE FTSE All Share Index (ALSI)

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Abstract

The study investigates the strong performance of South African property returns stocks after the REITs legislation came into affect in 2013 as well as the subsequent loss of value of property stocks experience from 2018. Additionally this paper makes use of a DCC GARCH model to explore the relationship between REITs and the rest of the ALSI equities on the Johannesburg Stock Exchange (JSE) to explain the role that REITs or property stocks can serve on a mixed asset portfolio using returns data from the JSE FTSE All Share Index.

1. Introduction

Real Estate Investment Trusts (REITs) around the world have become a popular investment vehicle to gain exposure to public real estate as an asset class. REITs were first created in the United States in 1960 as an investment vehicle to provide both institutional and retail investors with an accessible means of investing in income-producing real estate (Carstens and Wesson, 2019). What followed was the introduction of REITs in other countries such as Australia, Canada, Germany, Singapore etc. (National Treasury, 2007). Included in this list was South Africa, which introduced this type of listed property investment security in May 2013.

In South Africa, before the introduction of REITs, the most established types of property investment securities listed on the Johannesburg Stock Exchange (JSE) were Property Loan Stocks (PLSs) and Property Unit Trusts (PUTs) (National Treasury, 2007). Both these two types of common property investment vehicles suffered from tax inconsistencies, as PLSs paid capital gains tax on property sales and PUTs did not have this tax incidence (National Treasury, 2007). Overall, the property investment landscape was seen to be restrictive and lacked the regulatory structure to compete for capital on an international scale (Bredell and Boshoff, 2013). The introduction REITs offered investors, both foreign and domestic, greater opportunities to invest in the South African property market.

The reason for the introduction of REITs was the benefits associated with this securities design.

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REITs offered an accessible, safe, and simple means by which investors could invest in the property market (National Treasury, 2007). The structure of this listed security enhanced its liquidity as it can be traded daily on the JSE and offered predictable income streams, while offering opportunities for diversification (Bredell and Boshoff, 2013). This combined with the tax efficiencies over PUTs and PLSs, saw the number of listed property stocks rise in popularity in South Africa to the extent where today they make included in broader indexes such as the JSE All Share Index (ALSI), JSE Shareholder Weighted Index (SWIX) and JSE FTSE Top 40 Index (Carstens and Wesson, 2019).

The inclusion of REITs in such indexes alongside other traditional listed equities, that share similar regulations, has been questioned given that REITs are subjected to significantly different regulations. SA REITs are required to generate at least 75% of total income from immovable property and 75% of assets held by REITs must be immovable property such as shopping centres, office buildings and residential developments (Bredell and Boshoff, 2013). Additionally, REITs are required to invest in immovable property for the long term as opposed to speculative trading of properties (National Treasury, 2007). Concerning distributions of earnings, REITs are obligated to distribute more than 75% of earnings as dividends. In terms of debt, REITs are subjected to a gearing limit of 60% of debt to gross asset value (National Treasury, 2007).

The structure of the regulations governing REITs made this investment vehicle attractive. The adoption of these regulations had the implication of creating listed securities that offer higher dividends than predecessors property investment vehicles, experience lower volatility due to steady income streams, are seen as a cost-effective means of gaining exposure to property in one's portfolio, and lower entry and exit costs (Bredell and Boshoff, 2013). Additionally, REITs offer a diversified alternative to directly holding property due to multiple property holdings with a diversified tenant pool and by implication diversified income stream. According to Katzler and Song (2019), public real estate exhibit favorable risk-return characteristics and lower correlations with other financial assets such as equities and fixed income. The qualities that property poses as an asset class can aid in portfolio diversification through matching assets with low correlation profiles or even negative correlation profiles, and therefore provides an advantage of including public real estate in a mixed asset portfolio (Katzler and Song, 2019). The benefit of diversifying one's portfolio with REITs would then be based on its lower correlation with other assests. While these characteristics do provide an incentive to investors to include REITs as part of a mixed asset portfolio, a question that arises is whether REITs do indeed offer exposure to public property or are more similar to traditional listed equities in terms of their return profiles (Deng, Ding and Fei, 2010).

The purpose of this paper is twofold. First, to provide an explanation for the strong performance of property returns stocks after the REITs legislation came into effect in 2013 and fro the subsequent loss of value of property stocks experience from 2018. Second, to explore the relationship between REITs and the rest of the ALSI equities on the Johannesburg Stock Exchange (JSE) to explain the role that REITs or property stocks serve on a mixed asset portfolio. More specifically to determine

how the conditional correlation between the equity pairs changes over time. The model used to conduct this analysis is a Dynamic Conditional Correlation Generalized AutoRegressive Conditional Heteroskedasticity (DCC GARCH) model on returns data from the JSE FTSE All Share Index to generate time-varying conditional correlation estimates.

The paper is structure as follows: Section 2 provides a literature review and brief analysis of the performance history of REITS. Section 3 describes the data and methodology used in the study. Section 4 provides discusses and presents the results of the analysis. Finally, Section 5 concludes the findings of the paper.

2. Historical Performance of South African Property Stocks

In 2013, once the REIT regulation took affect the popularity and performance of SA REITs was the public property sectors inclusion in mixed asset portfolios increase substantially. As seen in Figure 3.1, the cumulative returns of REIT equities performed well and in fact outperformed the rest of the JSE FTSE All Share Index (ALSI) excluding REITs. Given the indexes weights are construction using market capitalization, it is important to bear in mind that the ALSI is heavily weighted in favour of listed companies with large market capitalization of their shares. With sectors such as resources being weighted heavily, due to their market capitalization, then results can be explained by the performance of the resources sector or the commodity cycle. Figure 2.2 provides credence to this insights as the plotted resources cumulative returns closely resembles that of the ALSI seen in Figure 2.1.

From 2013, management of REITs faced a globally competitive environment with high-growth pressure coming from the expected returns of investors (Carstens and Wesson, 2019). Management of REITs responded in two ways to this pressures and these responses can be relate to the REIT legislation. The results was that from 2014 and 2015 SA REITs market capitalization increased by 47% (Carstens and Wesson, 2019).

Firstly, in terms of distributions REITs earnings, pay-out ratios from 2013 to 2018 were at 100% despite the minimum requirement of 75%. According to Head of STANLIB Listed Property, Keillen Ndlovu (2019), since the introduction of REITs typically 100% of earnings were distributed to investors whereas in other countries typically only paid out between 75% and 90%. This ended in 2018 when Delta Property Fund decaresed their pay-out to the minimum of 75% (Ndlovu 2019). Thus, SA REITs have not made use of earnings to fund portions of their operations or services debt in an attempt to bolster share prices and have instead finance expansion through debt.

Secondly, the average debt to gross asset ratio of the vast majority of REITs increased from a low of 27% to 40% by July 2019 (Ndlovu, 2019), bearing in mind that the limit is 60%. Given the market's search for returns, SA REITS expanded their gross asset holding considerably through acquisitions and

new developments particularly in the commercial and retail property spaces (Carstens and Wesson, 2019). This resulted in increased share price returns for investors as high future income growth was priced in as the rapid expansion progressed. What soon became the case was that the South African market became over supplied with commercial and retail properties and REITs undertook purchases of foreign property assets to diversify their own income streams and by 2019, global exposure of the SA REIT market was 47% from being virtually zero a decade prior (Ndlovu, 2019).

By 2018, the SA REIT market was heavily indebted and unable to lease out the oversupplied commercial and retail space. Investors had started pricing in declining growth of future rental income streams and at the time interest had increased with the repo rate increasing from 5% in 2013 to a year high of 6.75% in 2018 (SARB, 2023). In early 2018, concerns mounted for the high debt ratios of REITs given decreases experienced in rental income that lead fund managers to quickly exit positions of REIT holdings driving share prices downwards by doing so (Ndlovu, 2019). What followed was that REITs began to pay of debt and thereby de-leveraging their operations which resulted in decreased dividend payouts with the result being further decreases in the stock prices of REITs and the sector losing over 25% of its value by the end of 2018 (Ndlovu, 2019). In 2020, REITs experienced a further blow as the COVID-19 pandemic reduced the demand of office space as hybrid work models were established and the pace at which retailers expanded there online stores increased rapidly, and subsequently the demand for retail space fell as well. Figure 2.3 highlights these developments in the REITs sector through plotting the noise reduced volatility of property stocks over time.
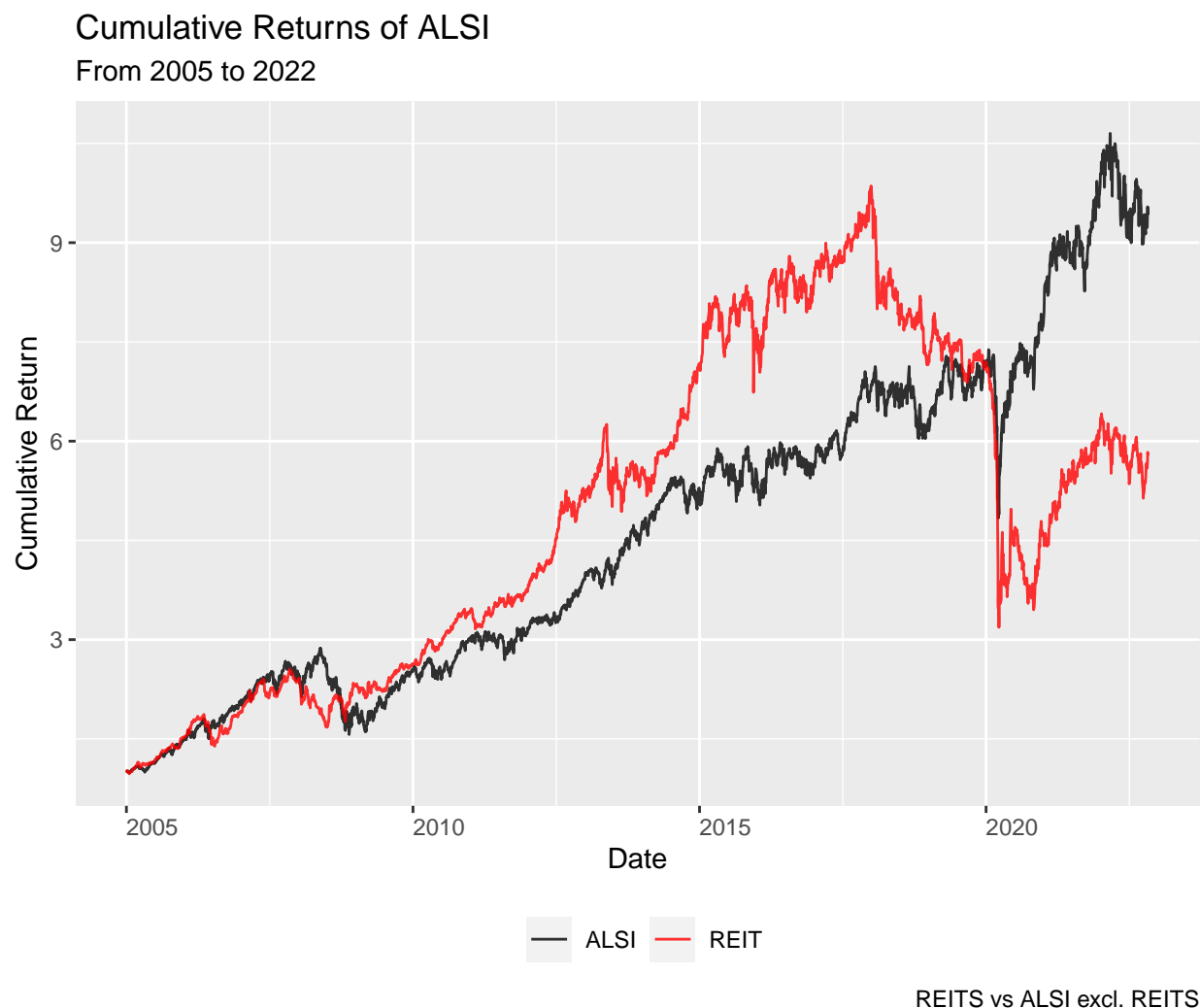
Figure 2.1: Cumulative Returns

2.1. Initial Analysis of the REITs Sector

The South African ALSI is heavily weighted by resources and the performance of resource stocks can be explained by the time line of the the commodity price cycle as these stock prices are heavily influenced by the prices of the commodities they produce and sell. Prior to the Global Financial Crisis (GFC) in 2008 the demand for commodities was high during this period often referred to as the end of the great moderation as economies around the world experiencing substantial increases in economic growth and infrastructure developments. After 2008, global demand for commodities did not experience the same growth as they did prior to the GFC. After the COVID pandemic the demand for resources increased substantially and the performance of resources stocks improve in kind.

From Figure 2.2, the cumulative returns of resources and property stocks appear to move in opposite

directions. A possible explanation maybe be related to property building costs and the logic would be as follows. When commodity or resources prices are cheap the cost to construct property is lower and therefore REITs would perform well with some lag. However, upon further investigation this does not seem plausible as the dynamic condition correlation between the property and resources, which is displayed in Figure 4.2, is significantly low but this cannot be entirely dismissed unless the correlation structure is explored between returns of resources and lagged property stock returns.
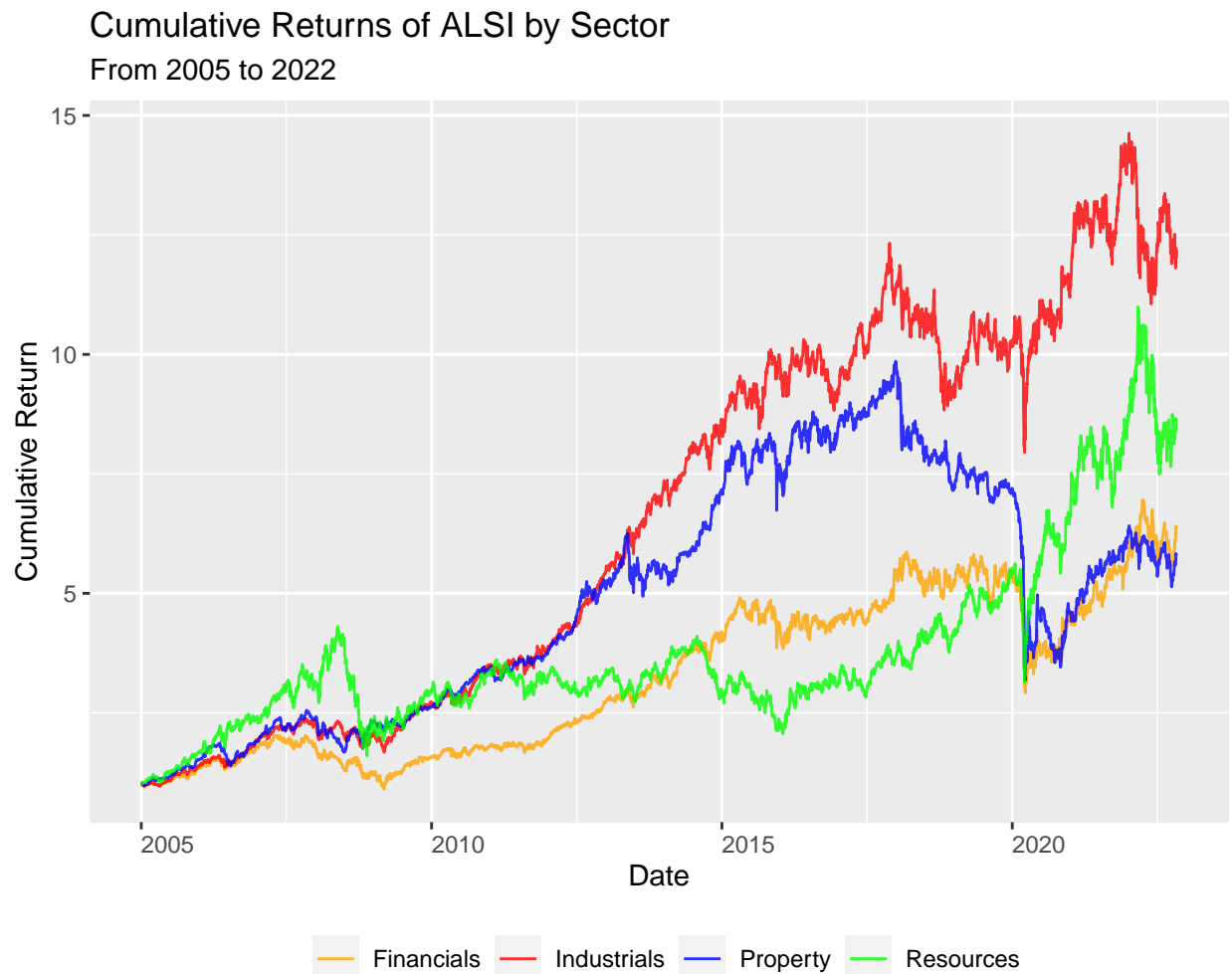
Figure 2.2: Cumulative Returns

When comparing noise reduce volatility in Figure 2.3, the All Share Index in South Africa experiences lower levels of volatility from 2005 to 2013. After 2013, SA REITs returns begin to experience highly volatile periods until the end of the sample period. From Figure 2.3, since 2013 there have have been four distinct spikes in volatility. The first being around the time the REIT regulation taking affect in May 2013 (Treasury, 2007). The second coinciding with the introduction of three REITs into the JSE

FTSE Top 40 Index, taking the total number of REITs included in the index to five (Carstens and Wesson, 2019). The third, occurring in 2018 when REIT share prices lost considerable value (Ndlovu, 2019). Finally, the fourth inline with the COVID pandemic timeline and the lock down that took place.
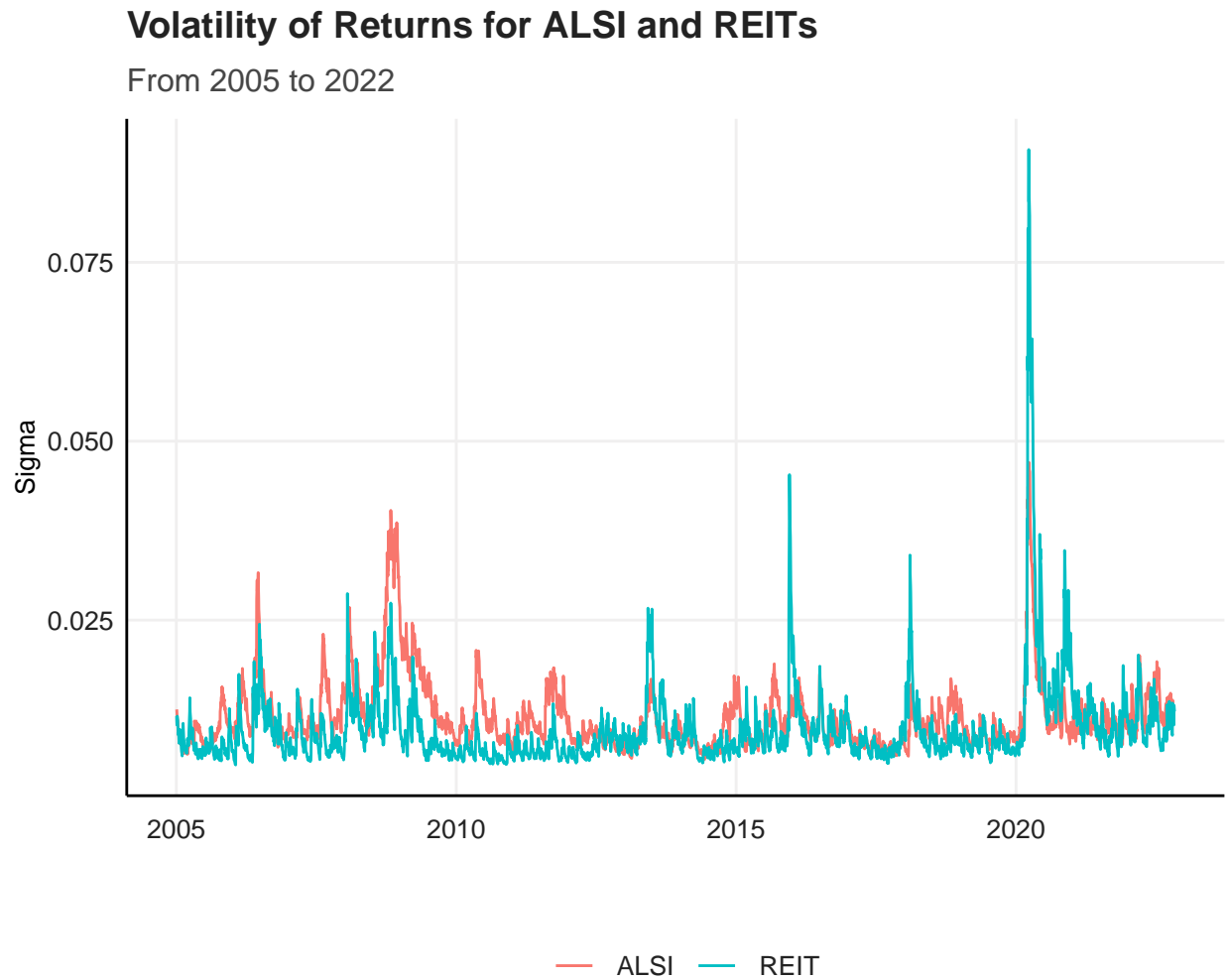

Figure 2.3: Noise Reduced Volatility

3. Data and Methodology

3.1. Data

The dataset used in this study is the JSE FTSE ALSI returns data from 2005 to 2022, which included both traditional equities and REITs. An investigation into the data reveals that there are four unique

sectors in the data, namely; Financials, Industrials, Resources and Property. The JSE FTSE ALSI is the primary share index of the South Africa market. The share index represents approximately the 99% of the largest companies subject to subject to minimum liquity and free float standards, where each listed company is weighted by its own market capitalisation against the summation of the market capitalisations of all companies within the index (FTSE Russel, 2023).

The Figure in Annexure A, displays the available data for each REIT. In the second half of the analysis Based on availability of data the following REITs are selected: Capital & Counties Properties PLC, Hyprop Investments Limited, Growthpoint Properties Limited, Resilient Reit Limited, Redefine Properties Limited, SA Corporate Real Estate Limited and Vukile Property Fund Limited.

3.2. Methodology

A Dynamic Conditional Correlation Generalized AutoRegressive Conditional Heteroskedasticity (DCC GARCH) model is used to perform this analysis. This model allows for the estimation of time-varying conditional correlation structures that are noise reduced, taking the GARCH(1,1) model further by allowing for multivariate volatility modeling (Engle, 2002; Katzke, 2022c).

The DCC model makes use of non-Linear combinations of univariate GARCH models to directly model the correlations as a dynamic time-varying process i.e. estimating the conditional correlation matrix directly (Engle, 2002)

The DCC GARCH model follows a two-step approach.

3.2.1. Step One

Estimates are obtained by fitting a univariate GARCH(1,1) model to the residuals of the vector autoregression (VAR) using the combined imputed data. The VAR allows for the examination of relationships between series over time and the residuals it produces α_t can be broken down into the structural volatility component z_t and the noise component μ_t, provided α_t are white noise errors/residuals Katzke, 2022b).

The DCC GARCH model is defined as follows:

$$H_t = D_t.R_t.D_t,$$

where H_t is positive definite variance-covariance matrix which is splits into identical diagonal matrices D_t and R_t, the time-varying correlation estimates. The estimation of R_T requires it to be inverted

at each estimated period, therefore a proxy similar to a GARCH(1,1), denoted by $Q_{ij,t}$, is to be used (Engle, 2002).

$$Q_{ij,t} = \bar{Q} + a\left(z_{t-1}z'_{t-1} - \bar{Q}\right) + b\left(Q_{ij,t-1} - \bar{Q}\right)$$
$$= (1 - a - b)\bar{Q} + az_{t-1}z'_{t-1} + b.Q_{ij,t-1}$$

Where $Q_{ij,t}$ the unconditional (sample) variance estimate between series i and j, and $\bar{Q}$ is the unconditional matrix of standardized residuals from each univariate pair estimate.

The following equation is used to estimate R_t:

$$R_t = \text{diag}\left(Q_t\right)^{-1/2} Q_t. \text{diag}\left(Q_t\right)^{-1/2}.$$

Which has bivariate elements:

$$R_t = \rho_{ij,t} = \frac{q_{i,j,t}}{\sqrt{q_{ii,t} \cdot q_{jj,t}}}$$

The resulting DCC model is then formulated as:

$$\varepsilon_t \sim N\left(0, D_t \cdot R_t \cdot D_t\right)$$
$$D_t^2 \sim \text{Univariate GARCH}\,(1,1)\text{ processes }\forall (\text{i},\text{j}), \text{i} \neq \text{j}$$
$$z_t = D_t^{-1} \cdot \varepsilon_t$$
$$Q_t = \bar{Q}(1 - a - b) + a\left(z'_t z_t\right) + b\left(Q_{t-1}\right)$$
$$R_t = \text{Diag}\left(Q_t^{-1}\right) \cdot Q_t. \text{Diag}\left(Q_t^{-1}\right)$$

3.2.2. Step Two

Using the standardized residuals from step one, the dynamic, time-varying conditional correlations estimates can be obtained using a log-likelihood approach.

The volatility approximation series that is estimated H_t, can then be standardized and used in fitting a DCC model for η_t (Katzke, 2022c).

$$\eta_{i,t} = \frac{\hat{\alpha_{i,t}}}{\hat{\sigma_{i,t}}}$$

The DDC GARCH model is run twice. The first iteration models the time-varying conditional correlation structure between the ALSI and REITs, as well as the time-varying correlation structure between the seven individual REITs included in the study. The second applies a stratification method to the data before the DCC GARCH model is re-run. The stratification methods enables one to examine how these time-varying conditional correlation structure change in periods of low and high volatility.

The stratification technique is used to isolate return dates when South African markets experienced high levels of volatility. To do this, the South African Rand is used as a benchmark index and is filtered for its own top and bottom quantile (20%) by monthly standard deviation of Rand volatility. These dates are then used to filter the ALSI_returns into dates with low and high volatility. The code used in this section follows a practical covered in Financial Econometrics 871 (Katzke, 2022a).

Following the stratification, the time-varying conditional correlation structure is mapped between Capital & Counties Properties PLC (Capco/CCO) and both the ALSI and other SA listed REITs. This section further explores the relationship between Capital & Counties Properties PLC, a UK based REIT and Redefine Properties Limited, an SA based REIT, whom are both listed on the JSE.

4. Results and Discussion

The following sections explores the results of the DCC GARCH model for different iterations of input data to explore the time-varying correlations of REITs. This section follows a top-down approach exploring the time-varying relationship between REITs and the ALSI as a whole, correlation between individual JSE listed REITS, periods of low and high volatility and between individual JSE listed REITs with the bulk of there operations in different geographic areas such as countries.

4.1. Time-varying Correlation: REITs and ALSI

From the results of the DCC GARCH model plotted in Figure 4.1, the current average correlation of the REITs sector with the JSE FTSE ALSI excluding REITs is approximately between 50% and 60%. This significantly higher from the approximate average correlation coefficient of 0.3 in 2013. What this may reveals is that through there expansion into new developments, acquisition of assets, increased liquid and marker capitalization as well as offshore holdings REITs have come to be more influence by similar macroeconomic variables to other listed equities. What can also be noted from Figure 2.3, is that REITs returns do appear experience more volatility then the ALSI excluding REITs.
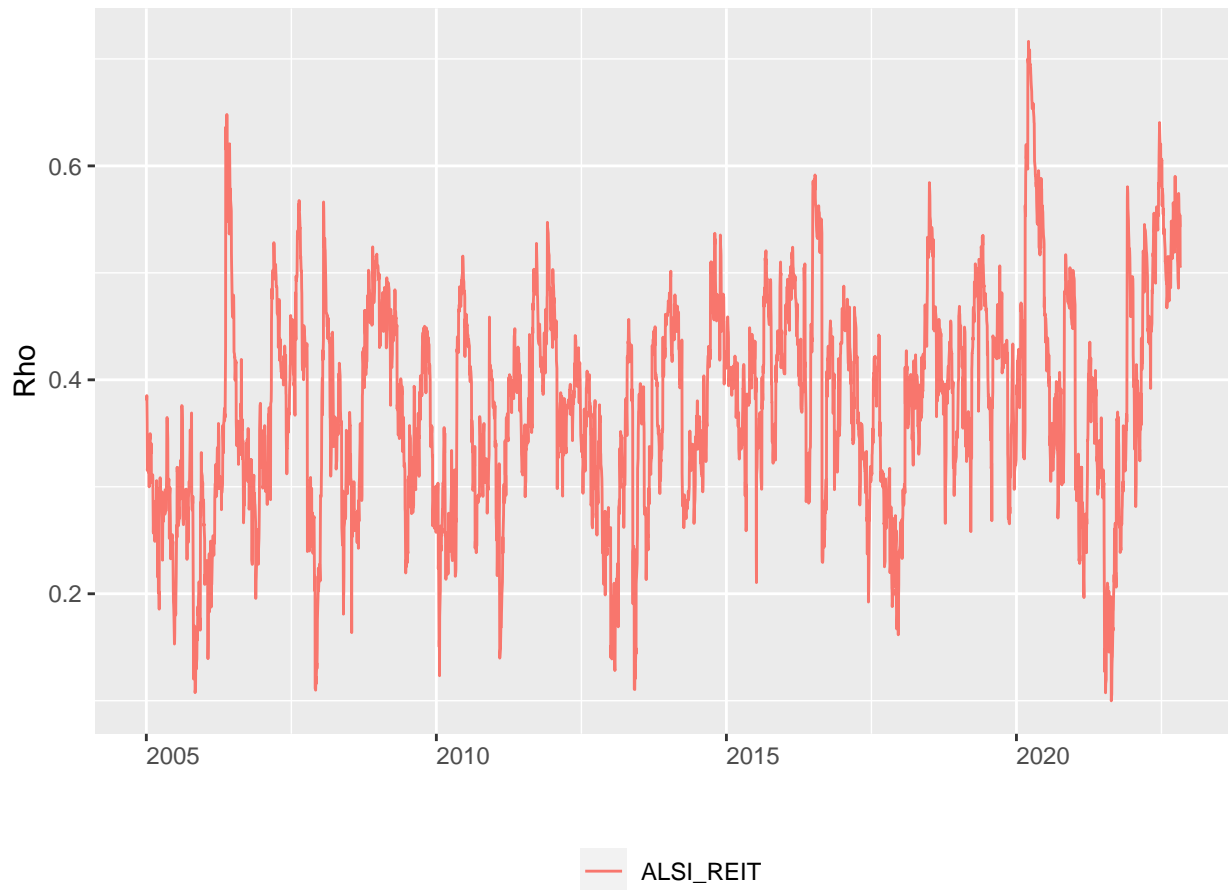
Figure 4.1: Dynamic Conditional Correlations Graph

A significantly strong relationship exists between the returns of financials and property stocks and has gained strength overtime. This is evident by the results displayed in Figure 4.2, the current approximate average correlation coefficient of 0.6 between the sector pair is stronger than between property returns and resources or industrial. This may be due to the similarities in the way that property and financials operate as both are both asset heavy businesses that make use of considerable amounts of leverage to scale their activities, they both charge semi-fixed rates whether it be interest or rentals that can be subject to escalations due to repo rate increases and finally, both experience economic down due to similar macroeconomic variables in the form of debtor defaults or property vacancies. This should not comes as a surprise as sell-side equity specialists that focus on financials typically cover property as well given there similarity in terms of business models and income structures. Therefore, for the sake of improving diversification one should be mindful what property and financials stocks

are held due to this increasing correlation trend and one may consider holding more resources with property if prove to be less correlated when controlled for with a lag.
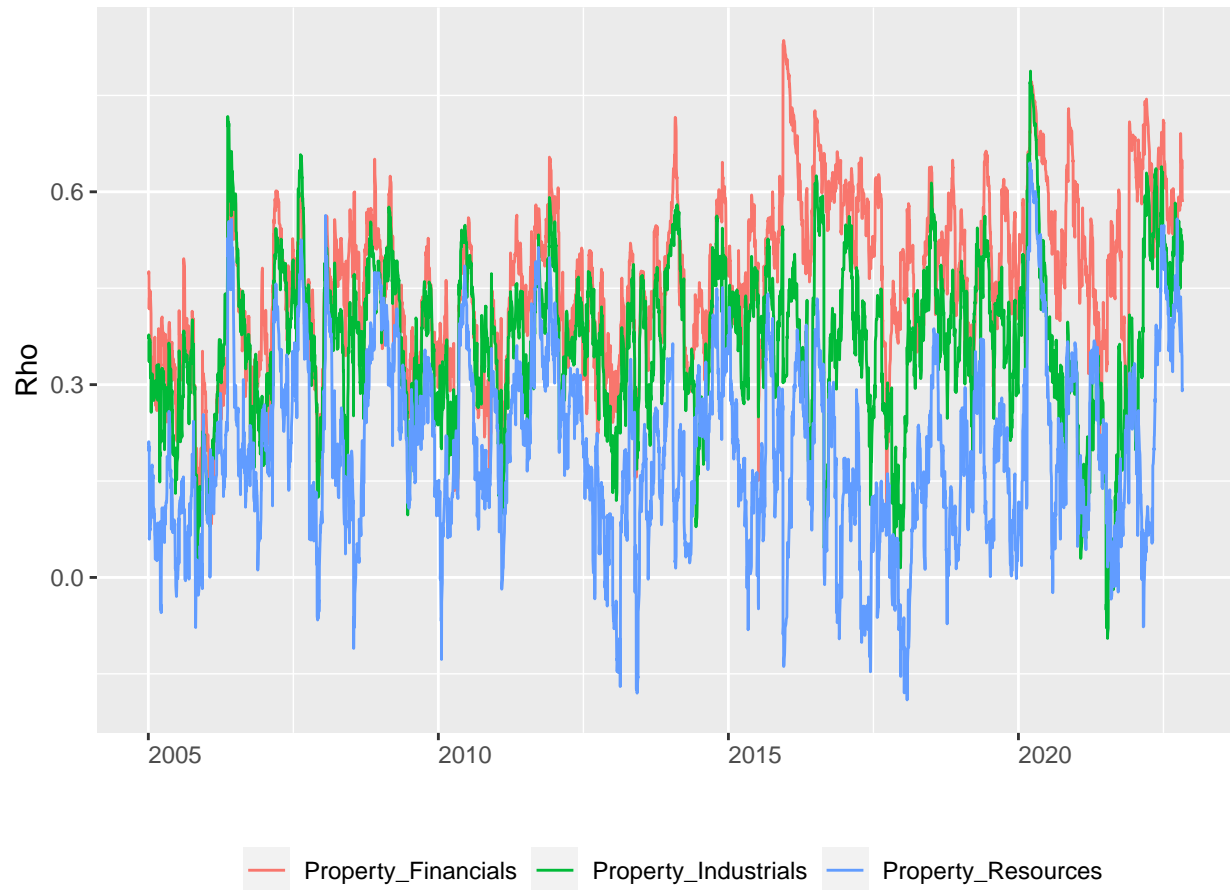

Figure 4.2: Dynamic Conditional Correlations Graph

4.2. Individual Propert Stocks

The REITs used to plot Figure 4.3 are selected for their long standing in the South African property market. Since the REIT regulation took effect in 2013, have all experience consistent correlation coefficient until the end of 2022. However, it is difficult to provide any analysis about these individual property stocks from this figure. Therefore the analysis turns to the individaul plotting of the time-varying conditional correlation coefficeints of each stocks with the ALSI excluding REITs.
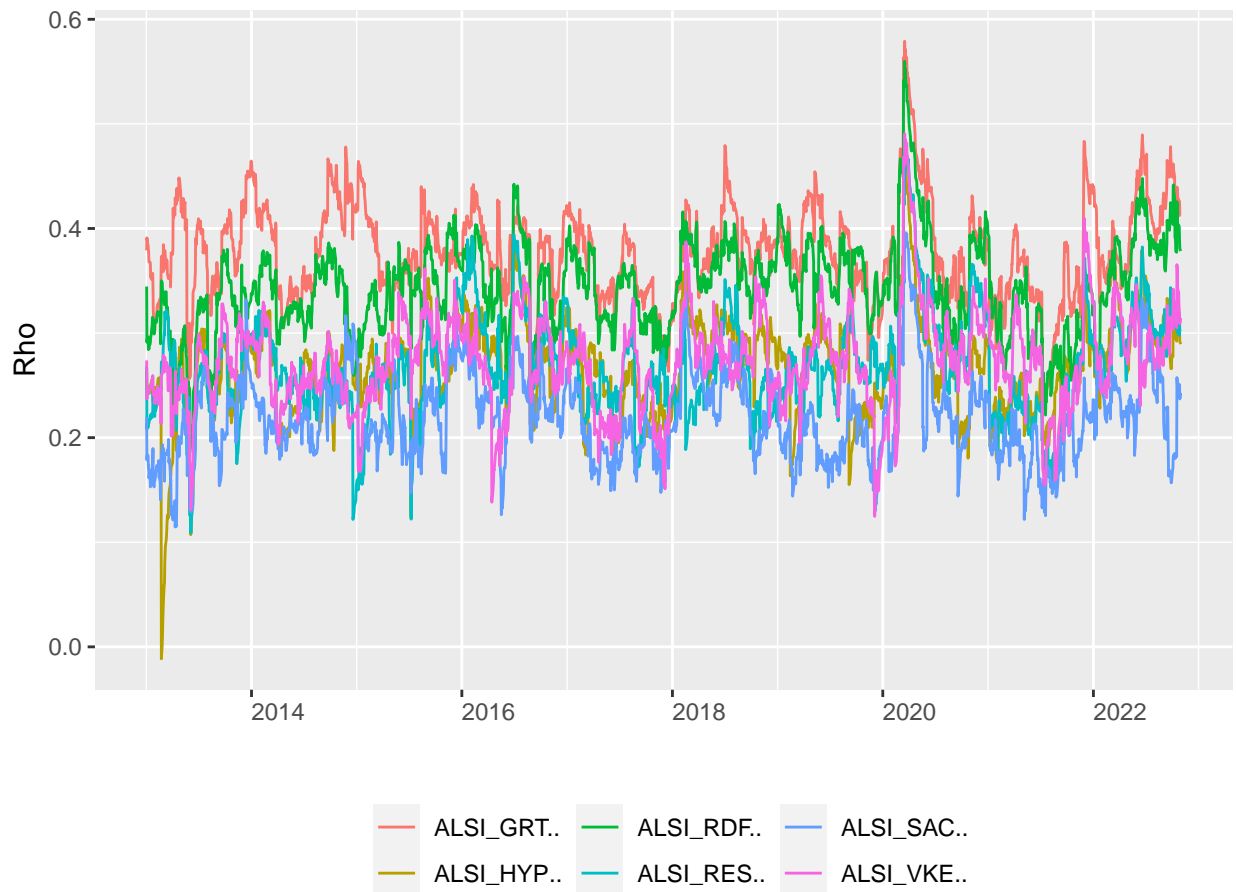
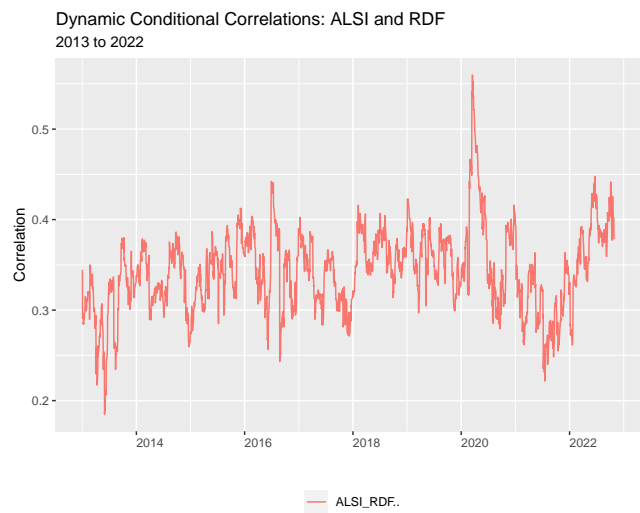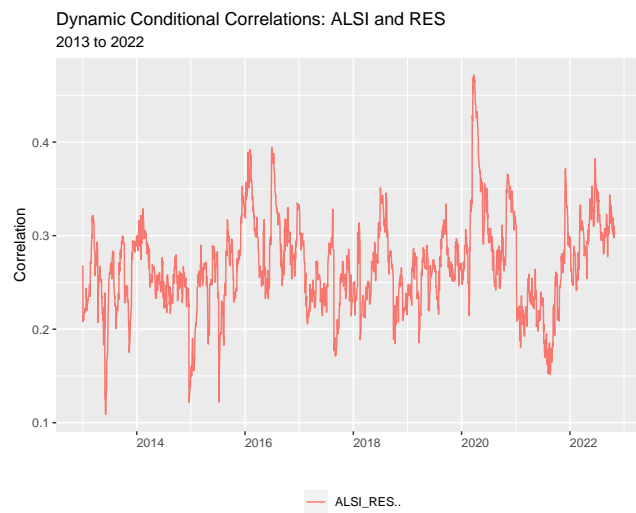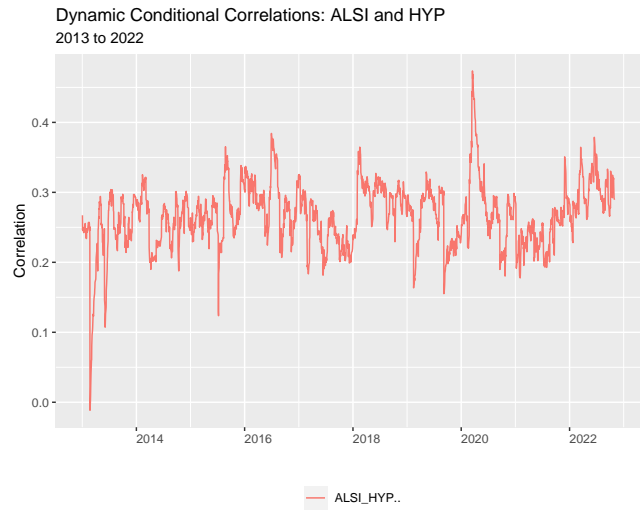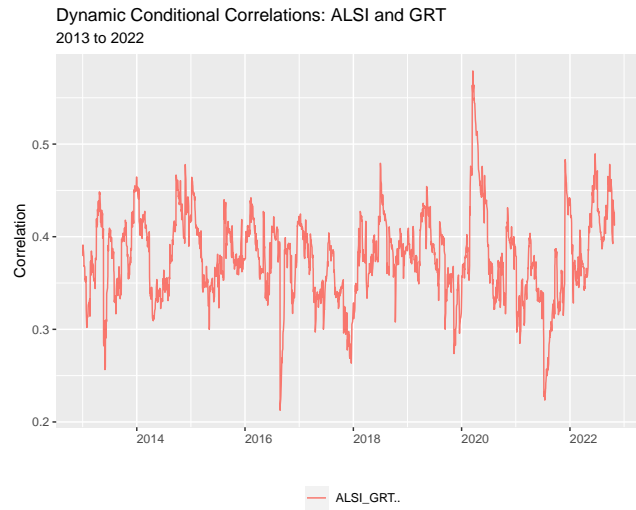Figure 4.3: Dynamic Conditional Correlations Graph

From these Figures of individual REITs and ALSI plotted below, one can see that this sample's returns reacts similarly at certain points in time to economic events all such as the effects of the national lock down due to the pandemic in early 2020. From these time-varying correlation graphs one can deduce that the returns of Hyprop Investments Limited (HYP) and the ALSI are the least correlated whereas the returns between Growthpoint Properties Limited (GRT) and the ALSI have the highest correlation within this smaller sample. Practically speaking for the sake of diversification in a mixed asset portfolio one would want to opt for HYP over GRT when considering only on the basis of correlation to improve diversification.

Dynamic Conditional Correlations: ALSI and GRT
2013 to 2022

Dynamic Conditional Correlations: ALSI and HYP
2013 to 2022

Dynamic Conditional Correlations: ALSI and RES
2013 to 2022

Dynamic Conditional Correlations: ALSI and RDF
2013 to 2022

Dynamic Conditional Correlations: ALSI and SAC
2013 to 2022

Dynamic Conditional Correlations: ALSI and VKE
2013 to 2022
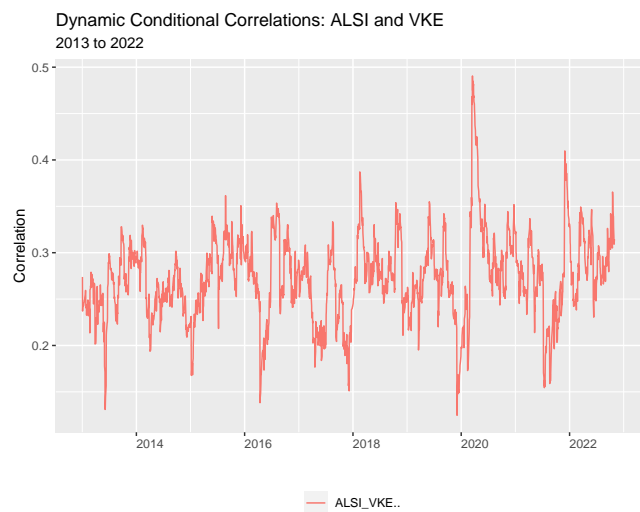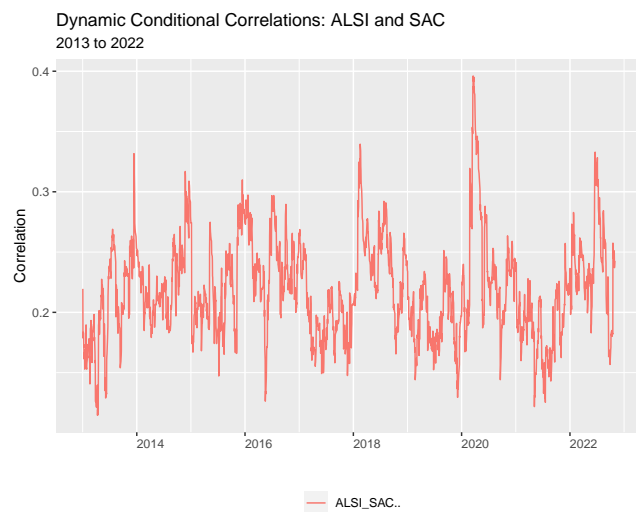
4.3. Time-varying Correlation: Periods of High and Low Volatility

In this section, periods of high USD/ZAR (Dollar Rand) volatility are isolated and used as to filter for the ALSI combined and imputed data. The premise being that periods of high Rand volatility can act as an indicator for high levels of volatility in South Africa financial markets and other asset classes. These highly volatile periods are then used as an index to filter the returns data for periods where South African markets were volatile.

Given that the high volatility combine imputed ALSI returns data will have large missing gaps due to periods of moderate or low volatility, dynamic correlations between equity pairs will have to be charted for short periods of a time. This is due to the fact that the graphing function used will not skip whole year periods.

Following this methodology of running multiple DCC models on smaller periods of high volatility decreases the run time of the model.

4.3.1. Periods of High and Low Volatility

When comparing the time-varying conditional correlations between the returns of the property sector and the ALSI for periods of high and low South African Rand volatility that there is a considerable differences in correlation coefficients. For periods of high Rand volatility the approximate average correlation is 0.5 whereas for period of low Rand volatility the approximate average correlation is 0.3. Thus, in periods of high Rand volatility macroeconomic events are having a greater effect on REIT returns. Practically speaking the understanding of how this relationship between the returns of the property sector and the ALSI during periods of high and low can inform investors how the level of diversification can change when factors that effect Rand price changes have on their listed property holdings during periods of low and high volatility. These results can be seen in Figures 4.4 and 4.5

Dynamic Conditional Correlations: ALSI and REITs
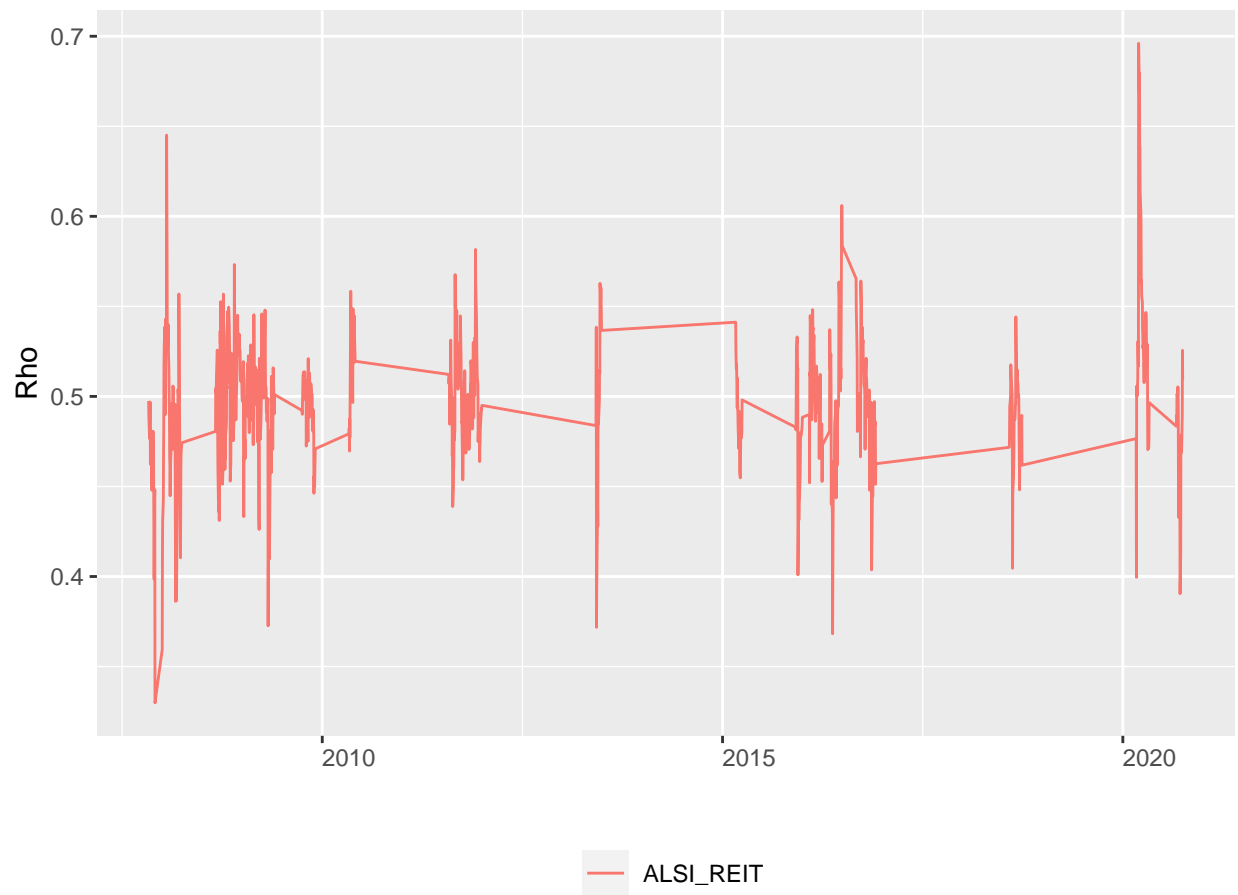
Periods of High Rand Volatility, 2007 to 2022

Figure 4.4: Dynamic Conditional Correlations Graph

Dynamic Conditional Correlations: ALSI and REITs

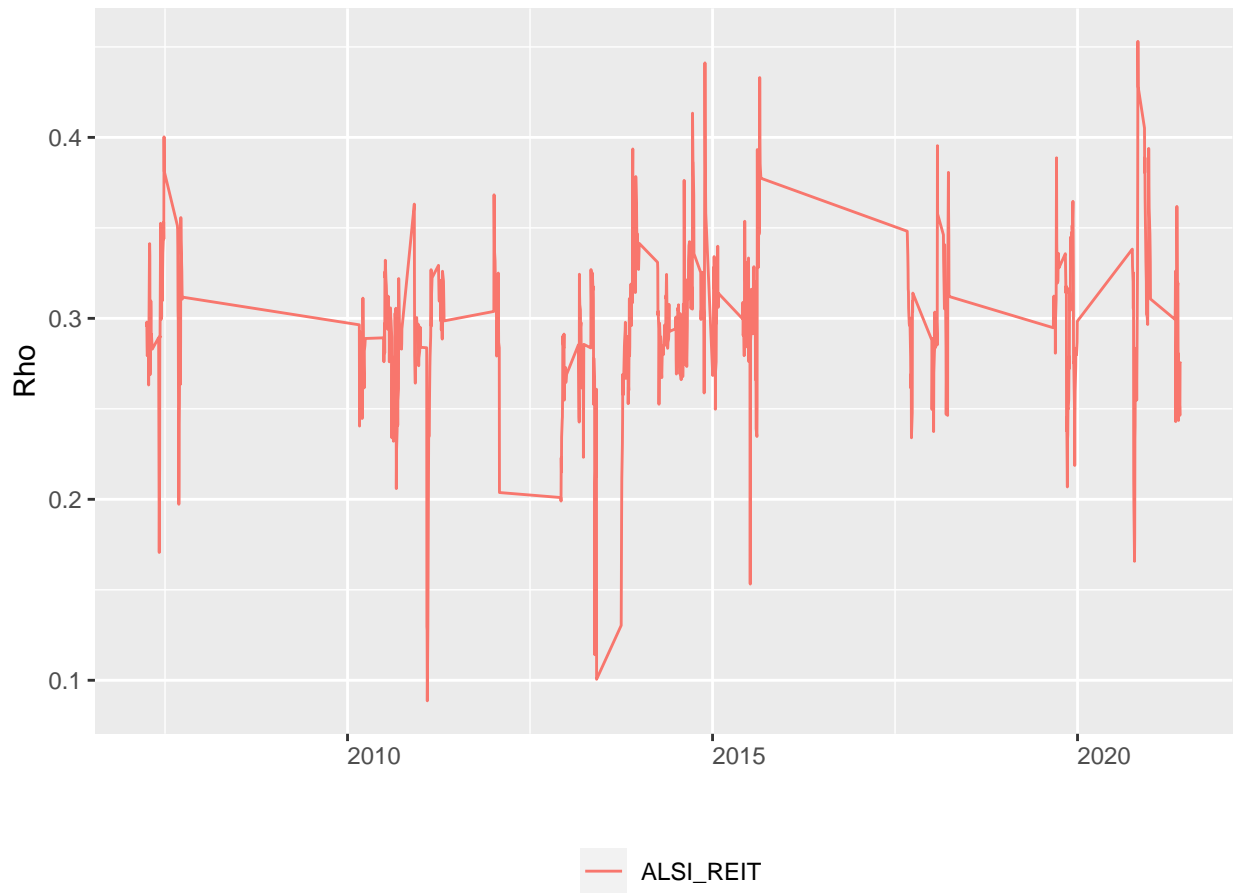Periods of Low Rand Volatility, 2007 to 2022

Figure 4.5: Dynamic Conditional Correlations Graph

4.4. *Capital & Counties Properties PLC and Redefine Properties Limited*

This section applies similar techniques as discussed above between two JSE listed REITs namely, Capital & Counties Properties PLC and Redefine Properties Limited. Capital & Counties Properties PLC is a listed company based in the United Kingdom and focuses on developments in London whereas Redefine Properties Limited is a listed REIT with large South African holdings.

For the period June 2018 to October 2022 the conditionally correlation for RDF and the ALIS as well as COO and the ALSI. From Figure 4.6, prior to 2020 there did exist a signification difference in average approximate time-varying correlation coefficient with a coefficient of 0.25 for COO and 0.4 for RDF indicating differences in location of assets and income structures. However, with the onset of the pandemic followed by the high global inflation and tighter monetary policy across the globe

the correlation between returns has since narrowed, but towards the end of 2022 the this spread has begun to increase again and COO may offer investors a Rand hedge and further diversification to the ALSI then RDF can offer. Figure 4.7 demonstrates how the average correlation between the returns of COO and RDF have changed over this four year period. It appears as the the correlation coefficient has increased especially since the pandemic. This may confirm that during periods of higher volatility global factors have a greater and more similar affect on returns which can be observed in figures 4.8 and 4.9.

Dynamic Conditional Correlations: ALSI, CCO and RDF
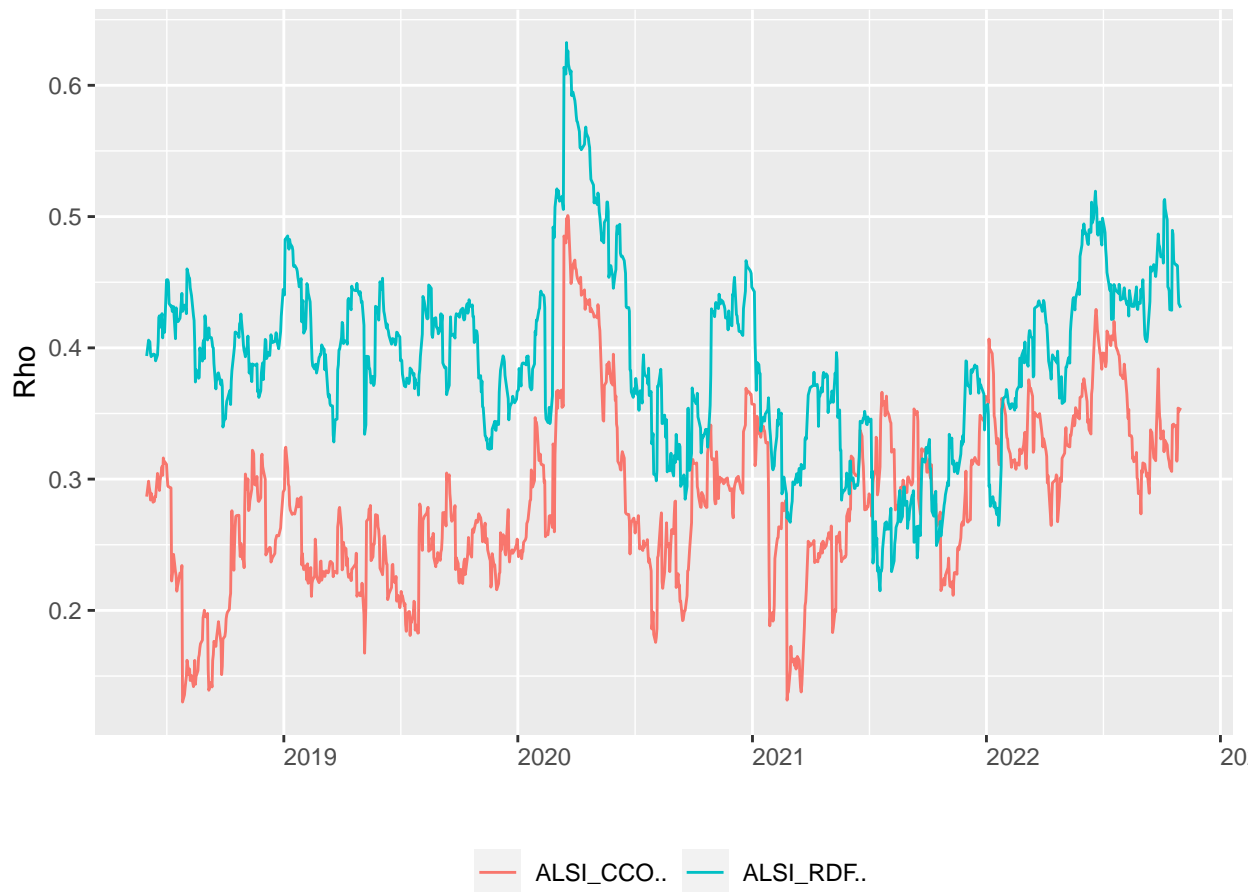### 2018 to 2022
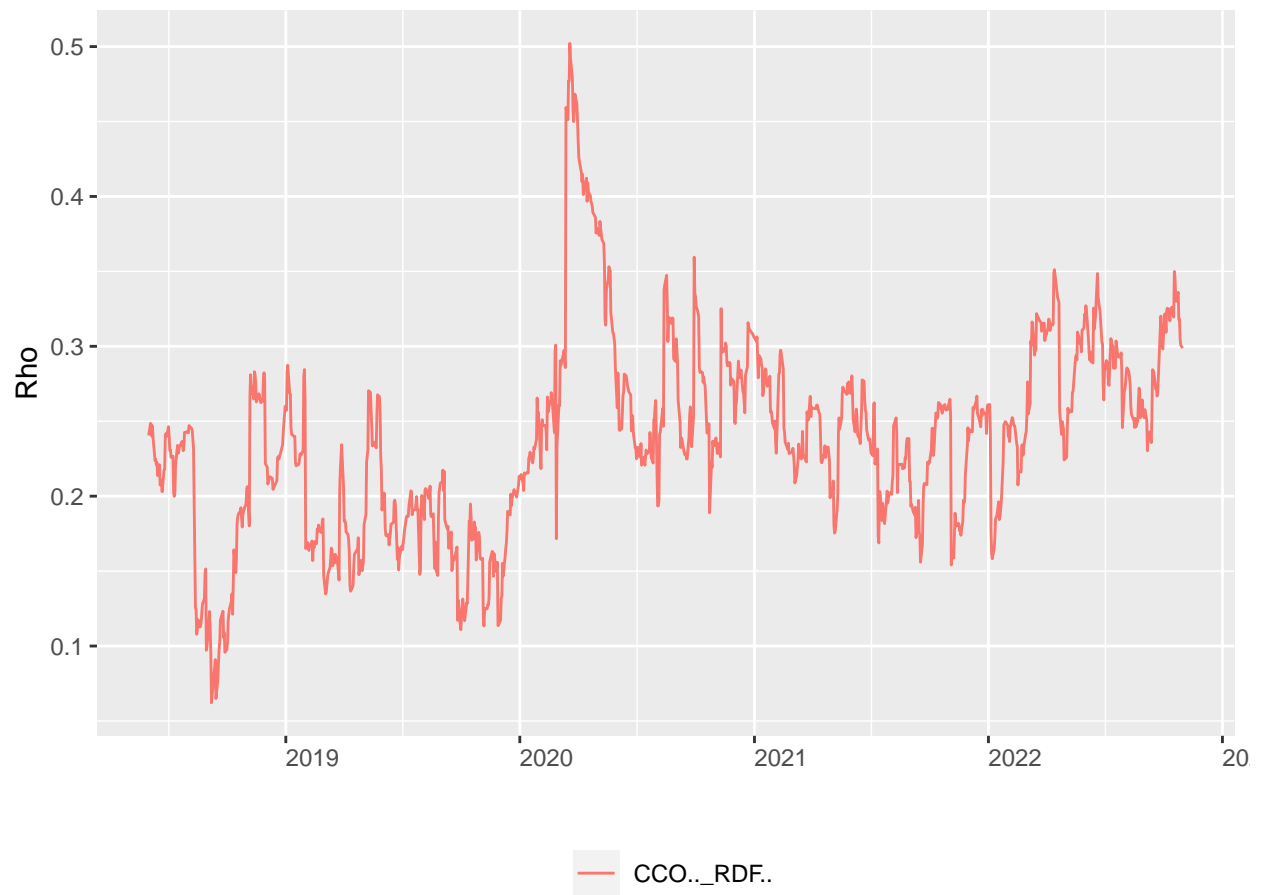

Figure 4.6: Dynamic Conditional Correlations Graph

Figure 4.7: Dynamic Conditional Correlations Graph
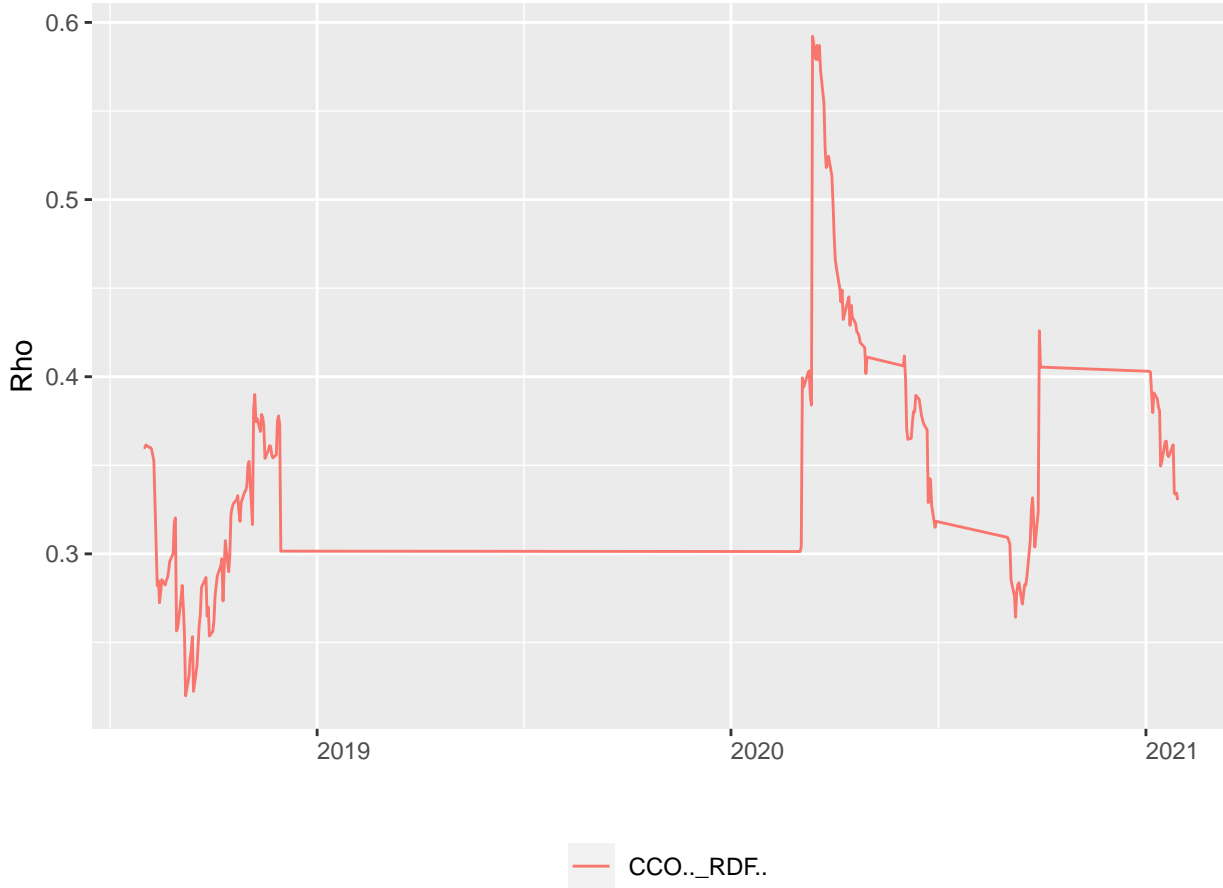
Figure 4.8: Dynamic Conditional Correlations Graph

Dynamic Conditional Correlations: CCO and RDF
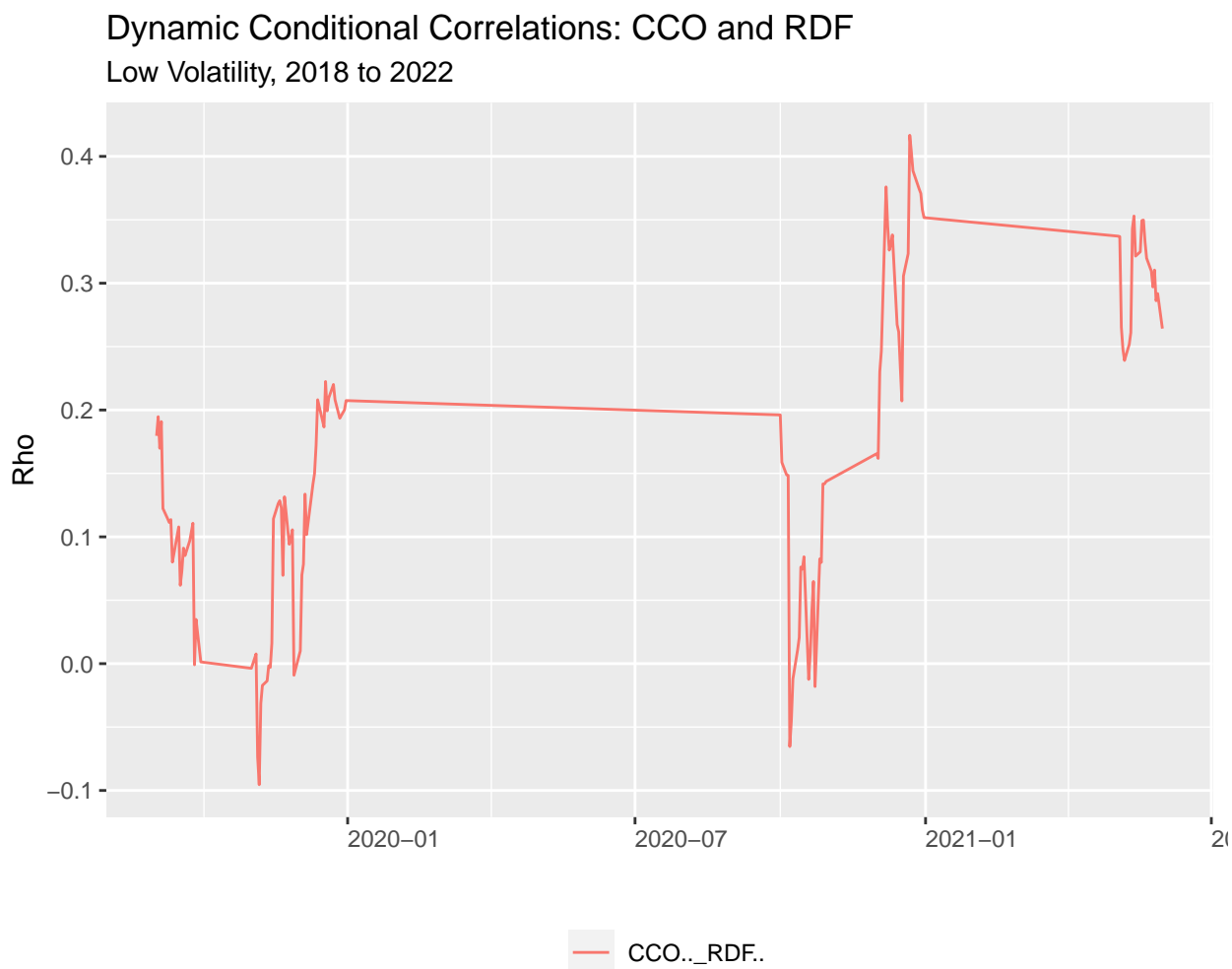### Low Volatility, 2018 to 2022

Figure 4.9: Dynamic Conditional Correlations Graph

5. Conclusion

One potential rationalisation for this low correlation between the selected REITs and other JSE listed equities may be that due to the nature of REITs, that is their diversified income stream. The implication being that REITs receive income from tenants across various industries, whether is be income from commercial or residential properties only adds to the diversification of this income stream. If one industry, other than property, experiences substantial volatility in its return profile, again by the nature of the income stream, the impact of any losses in rental income will be muted by other more stable industries. Thus, the explanation for such low correlation returns structures can be concluded as broad macro volatility experienced by country wide factors such as currency volatility, increased money supply, global or national level recession.

A consideration that must be made is that only when an asset is as liquid as the other assets it is being compared to, may one be able to ascertain whether its true correlation structure with other assets. The research that listed equity receive and considerable transactions by brokers and traders keep prices relatively up to date in terms of prices reflecting new information. Thus, prior to the 2013 REIT legislation it may be that not all relevant information was not priced into property stocks.

Since the introduction of the REITs legislation the correlation coefficient of returns of the SA REITs sector and the ALSI excluding REITs appears to be increasing over the sample period. This trend may be a result of property stocks having become mode similar to traditional equities post legislation. This may be explained by the increased liquidity in trading REIT shares on exchanges, making REITs more competitive and accessible to foreign makes, increased offshore holdings, debt ratios and greatly increased market capitalization of the sector. That being said REITs do offer investors options to greater diversify their portfolios and provide Rand hedges, however one must consider prevailing macroeconomic conditions not only with the view that it will effect one's portfolio returns, but that these conditions will affect how truly diversified a portfolio is.

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Annexure A

JSE listed REITs over time

Note how many REITs have complete data sets

Figure 5.1: REITs Dataset