Gordon Institute of Business Science
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The effects of property specific style-based variables on the returns of South African listed property equities

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Abstract

Contrary to the Capital Asset Pricing Model (CAPM) and the Efficient Market Hypothesis (EMH), styles-based variables of value, size and momentum have been well documented to show strong associations with cross-sectional equity returns on the Johannesburg Stock Exchange (Hoffman, 2012; C. Muller & Ward, 2013) and on international stock exchanges (Carhart, 1997; Fama & French, 1992). Yet little research has exclusively focused on style-based variables and the JSE listed property sector. It is worth noting the total market value of property stocks or real estate investment trusts (REITs) has grown rapidly both in South African and Internationally. In 1995 the market capitalisation of the JSE listed property sector was R15 billion, but by November 2015 this had grown to a market capitalisation of R665 billion (iNET Bridge, 2015).

This research study examined the effects of 22 style-based variables on all JSE listed property companies over the period December 1995 to December 2015. The style-based variables included property specific variables, such as geography location, sector allocation, and vacancy percentage. Since such data was not readily available from financial data libraries, a database was created directly from the financial statements reported by each company. The same methodology and graphical time series approach as C. Muller and Ward (2013) was used to evaluate the performance of the examined styles.

The study found that portfolios constructed on the basis of ranked style-variables exhibited significant effects over the period. Most notably, both the size (market capitalisation) and value (earnings yield) effects showed significant excess returns and linear relationships, but persistence has not been evident after 2010. Other style-variables that exhibited effects over the period were: total geographic concentration, price to NAV, vacancy percentage of portfolio, value traded, value traded as a percentage of market capitalisation, interest cover ratio, loan to value and geographic international percentage. Furthermore, the study found no evidence of the momentum effect, which was found to be the best performing strategy by C. Muller and Ward (2013) for general equities.

Keywords

Listed Property; REITs; Style-based effects; Price effects

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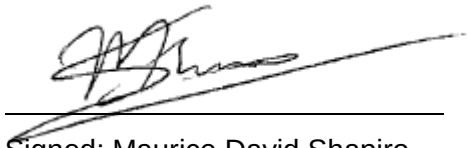
Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.



Signed: Maurice David Shapiro

13 January 2016

Date

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1 Introduction to Research Problem

1.1 Background

1.1.1 Style Investing

Investors and fund managers seek to persistently outperform the market and will spend significant time and resources in finding algorithms to aid them (C. Muller & Ward, 2013). Finding the holy grail of investment finance would be to find a methodology that persistently outperforms the market (C. Muller & Ward, 2013). Such simple algorithms are defined as “styles” (Christopherson & Williams, 1997).

Much of modern financial theory is based on Markowitz’s (1952) premise that the market is mean-variance efficient, such that investors would want to select a portfolio that is an efficient combination of both expected return and its variance. According to the Capital Asset Pricing Model (CAPM) and the Efficient Market Hypothesis (EMH) a company’s share price should reflect all available information (Sharpe, 1964). It would be expected that given the EMH that simple trading rules or styles should only produce short-lived advantages.

Basu (1977, 1983) first showed the value effect to have abnormal and consistently higher risk-adjusted returns, contrary to EMH and CAPM. The value effect is a style of buying shares with a high measure of fundamental value compared to its market capitalisation, usually represented by a price to earnings (P/E) ratio or earnings yield (EY) (Auret & Cline, 2011)

A number of studies both internationally (Asness, Moskowitz, & Pedersen, 2013; Banz, 1981; Cakici & Tan, 2014; Chui, Titman, & Wei, 2010; Fama & French, 1992, 2010, 2012; Hou, Karolyi, & Kho, 2011) and on the South African market (Auret & Cline, 2011; Auret & Sinclaire, 2006; Basiewicz & Auret, 2009; C. Muller & Ward, 2013; D. Page & Auret, 2014; M. J. Page & Palmer, 1993; M. J. Page, 1996; Strugnell, Gilbert, & Kruger, 2011; van Rensburg & Robertson, 2003; van Rensburg, 2001) have shown that simple algorithms based on style variables (company size, price to earnings ratio, gearing, book to market value, dividends, momentum) have strong associations between cross-sectional equity returns and such style variables.

Wahal and Yavuz (2013) suggested that style investing plays a role in predicting returns and that investing behaviour in which investors chase style returns amplifies the

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waves in asset returns. Barberis and Shleifer (2003) proposed that under certain conditions style investing can generate predictability in returns.

1.1.2 Property Sector

Directly investing in property can require large amounts of capital, this may require investors to seek external funding in the form of debt to allow them to purchase the property (Hager & Lord, 1985). Property or real estate ownership is often recognised as an investment with the ability to hedge against inflation since properties have the ability to earn rental income that exceed the rate of inflation over long periods of time (Hager & Lord, 1985).

Besides investing in direct property investments, investors can invest in Real Estate Investment Trusts (REITs), listed equities owning property investments for the purpose of collecting rental income (SA REIT Association, 2015b). South African REITs are principally listed on the Johannesburg Stock Exchange (JSE). Prior to the formation of the South African REIT Legislation on the 1st May 2013 (SA REIT Association, 2015b), South African investors could invest in Property Unit Trusts (PUTs) and Property Loan Stocks (PLSs) both listed on the Johannesburg Stock Exchange (JSE) (Buchner, 2008; SA REIT Association, 2015a).

According to Buchner (2008), some of the benefits in investing in listed property equities are:

- Access to high quality or large property assets without requiring a large capital investment. This provides investors the ability to invest in property assets that may not have been easily accessible;
- Diversification of the property investments from exposure to multiple: buildings, tenants, lease expiry profiles, property sectors and geographies;
- Price transparency, as price movements are available on a live basis via the JSE;
- Liquidity of investment, compared with direct property investments which are highly illiquid. It should however be noted that the average value traded of most property equities are far less than that of the large capitalisation general equities, and that except for the larger property equities, the listed property sector could be considered illiquid compared to other general equities (iNET Bridge, 2015);
- Greater flexibility to respond to changing market conditions;
- Cost reduction of property management through economies of scale;

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The total market value of property stocks or real estate investment trusts (REITs) has grown rapidly both in South African and Internationally. In 1995 there were 40 property companies listed on the JSE with a market capitalisation of R15 billion (iNET Bridge, 2015; Muller & Ward database, 2015). By December 2015 there were 50 property companies listed on the JSE with a market capitalisation of R665 billion (iNET Bridge, 2015; Muller & Ward database, 2015). During 2015 more that R20 billion was raised in the listed property sector through initial public offerings, rights offers and private placements, and in general these offers were oversubscribed (J. Muller, 2015). According to MoneyMate (2015), for the period 31 October 2015, there were 38 unit trusts that specialise in the South African listed property sector with R56 billion of capital managed by these funds (see Table 1).

Similarly, internationally in 1990 there were 117 REITs with a total market capitalisation of about $8.5 billion. By 2005, the number of REITs had increased to 208, with a total market capitalisation of $355 billion (Hartzell, Mühlhofer, & Titman, 2010). Along with this growth in the property sector there has also been a growth in number of mutual funds (unit trust) that specialise in the property sector. Over the same period, the number of property focused funds had grown from 16 to 132, while the amount of capital managed by these funds had grown from $1.3 billion in 1994 to $50 billion in 2005. This growth has outpaced other sector specific funds, suggesting that property funds may be unique compared with other specialist focused funds (Hartzell et al., 2010).

The South African listed property sector has been the top performing asset class over the last 15 years as demonstrated by Figure 1 and was the best performing assets class in 2014 with a return of 26.64% for the year according to Figure 2. The total return for the South African listed property sector (FTSE/JSE SA Listed Property Index - J253T) over the period January 2005 to November 2015 has been 709%, 21.1% annualised, compared with the JSE All Share index (FTSE/JSE Africa All Share Index - J203T) over the same period which has been 466%, 17.2% annualised (iNET Bridge, 2015). According to J. Muller (2015), “It seems increasingly likely that property stocks will turn out for the second year running to be a more lucrative bet for investors than general equities, cash or bonds.”

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Table 1: List of Property Specialist Unit Trusts (Sector Classification: South African - Real Estate – General)

Fund Name	Capital Managed R Million
Absa Smart Alpha Property Fund - A	57
Absa Property Equity Fund	836
ACi Property Index Fund - A	349
Altre BCI Real Return Property Fund - A	652
Ampersand Momentum Flexible Property Income Fund - A	508
Anchor BCI Property Fund	1
Ashburton Multi Manager Property Fund	615
Autus BCI Property Fund - A	141
Catalyst Flexible Property Prescient Fund - A	1
Catalyst SA Property Equity PSG Fund - A	1 005
Contego B4 MET Property Fund	125
Coronation Property Equity Fund - A	2 814
Discovery Flexible Property Fund	2 378
Dolberg Spencer BCI Property Fund - A	56
Efficient BCI Property Fund	28
Harvard House BCI Property Fund	3
Investec Property Equity Fund - A	6 201
Investment Solutions Property Equity Unit Trust Fund	3 962
Marriott Property Income Fund - A	457
Mazi Capital MET Property Fund - A	69
Metope MET Property Fund - A	5
Momentum Property Fund - A	1 051
Nedgroup Investments Property Fund - A	2 103
NGI Private Wealth Property Fund	902
Oasis Property Equity Fund	783
Old Mutual SA Quoted Property Fund - A	6 096
Plexus Wealth BCI Property Fund	263
PortfolioMetrix BCI SA Property Fund - A	393
Prescient Property Equity Fund - A1	5
Prudential Enhanced SA Property Tracker Fund	5 243
Satrix Property Index Fund - A1	699
Sesfikile BCI Property Fund - A1	458
SIM Property Fund - A	5 746
STANLIB Multi-Manager Property Fund - A	3 761
STANLIB Property Income Fund - A	7 689
Sygnia Listed Property Index Fund - A	1
True North IP Enhanced Property Fund	70
Warwick MET Property Fund - A	406

source: (MoneyMate database, 2015)

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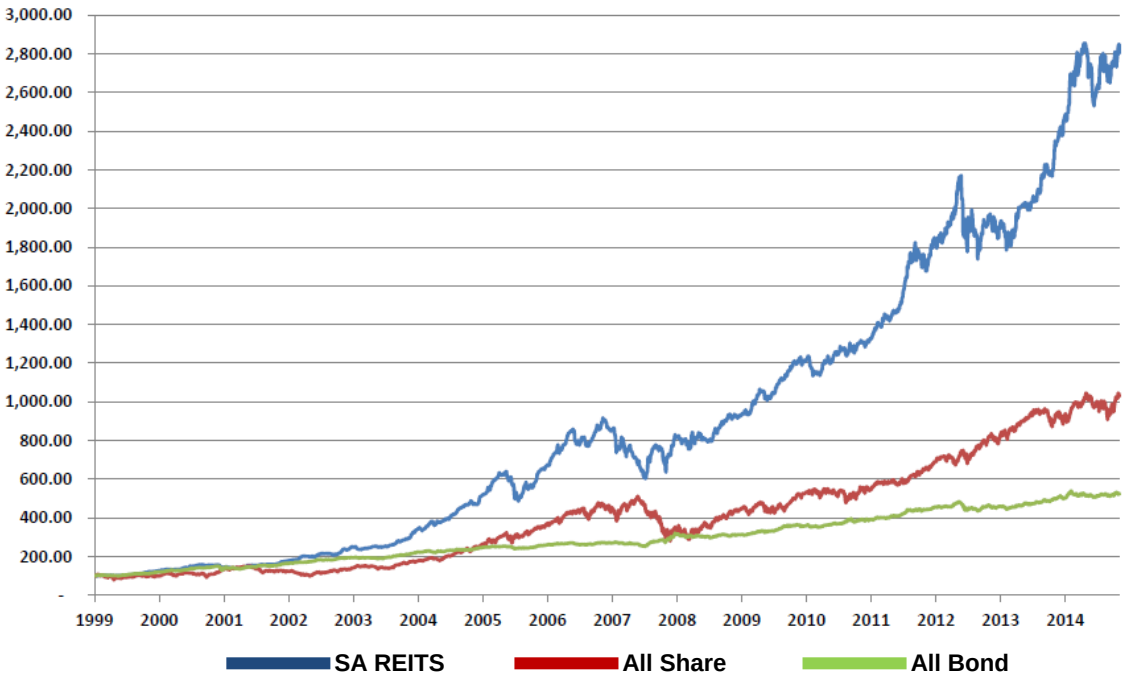
Figure 1: Total Returns Indexes per Asset Class 1 Jan 1999 to 31 October 2015



source: (SA REIT Association & Grindrod Asset Management, 2015)

Figure 2: Asset Classes: Which were the top performers? 2008-2014

2008	2009	2010	2011	2012	2013	2014
Foreign Bonds 54.25%	SA Equity 32.13%	SA Real Estate 25.50%	Foreign Bonds 30.83%	SA Real Estate 35.88%	Foreign Equity 56.36%	SA Real Estate 26.64%
SA Bonds 17.02%	SA Real Estate 18.69%	SA Equity 18.98%	Foreign Equity 15.26%	SA Equity 26.68%	SA Equity 21.43%	Foreign Equity 15.91%
SA Cash 11.70%	Balanced 18.26%	SA Bonds 14.96%	SA Real Estate 12.19%	Foreign Equity 21.72%	Balanced 21.13%	Foreign Bonds 11.19%
SA CPI 10.97%	SA Cash 9.13%	Balanced 13.46%	SA Bonds 8.82%	Balanced 21.38%	Foreign Bonds 15.51%	Balanced 11.11%
SA Real Estate -9.71%	SA CPI 7.13%	SA Cash 6.93%	Balanced 7.28%	SA Bonds 15.99%	SA Real Estate 8.39%	SA Equity 10.88%
Balanced -10.69%	Foreign Equity 3.52%	SA CPI 4.27%	SA Cash 5.73%	Foreign Bonds 6.45%	SA CPI 5.40%	SA Bonds 10.15%
Foreign Equity -19.73%	SA Bonds -1.03%	Foreign Equity 0.44%	SA CPI 4.96%	SA CPI 5.58%	SA Cash 5.18%	SA CPI 6.37%
SA Equity -23.23%	Foreign Bonds -20.51%	Foreign Bonds -4.36%	SA Equity 2.57%	SA Cash 5.54%	SA Bonds 0.64%	SA Cash 5.90%

source: (Ruiters, 2015)

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1.2 Research Problem and Purpose

This study investigates the effect that property specific style-based variables have on the returns of South African listed property companies and if portfolios constructed based on these styles of fundamental property specific variables would persistently show outperformance.

Much of the research that has been done both locally and internationally has focused on general equities and the styles of value, size and momentum (Carhart, 1997; Fama & French, 1992). While little research on style-based effects has exclusively focused on REITs or listed property companies and then usually only on mutual funds investing in REITs (Cici, Corgel, & Gibson, 2011; Hartzell et al., 2010). Notably, Cici et al. (2011) have looked at trading strategies based on geographic concentration of underlying properties, net asset value to price ratios, dividend yield and leverage of the underlying REITs.

This study's purpose is to extend the current academic literature by firstly focusing on the South African listed property sector and then by including more styles based on property specific variables. Previous well researched styles of value, size and momentum have been applied to South African listed equities. C. Muller and Ward (2013) found that both momentum and value styles demonstrated persistent outperformance on the largest 160 shares by market capitalisation listed on the JSE, this study will extend this research to focus of the listed property sector.

Property specific fundamental based styles of geographic concentration, net asset value to price ratios, dividend yield and leverage which have been researched internationally (Cici et al., 2011) will be extend by exploring these variables effects on the property companies listed on the JSE. The study also looks to include sector concentration of underlying properties as a property specific style. Sector concentration is similar to geographic concentration as a metric of diversification of the underlying property investments and is often reported by companies and followed by analysts (SA REIT Association, n.d.)

l'Ons and Ward (2012) found consistent outperformance of the price earnings growth (PEG) ratio, a valuation model that either uses historical data to extrapolate future earnings growth or analyst consensus forecasts of earnings growth (Easton, 2004). This study includes dividend growth as a style to be applied to the JSE property sector. Dividend growth, similar to the PEG ratio, incorporates a growth ratio of the value style

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of dividend yield, rather than price earnings. This study has used historic growth as opposed to forecast growth. Dividend growth is also a variable often reported by companies and followed by analysts (SA REIT Association, n.d.)

Hager and Lord (1985) advise that the need for investors to use debt to purchase property investment was because of the large capital amounts required. Similiarly, listed property companies deploy leverage as a means to enhance shareholder return (SA REIT Association, n.d.). The study includes two new property styles to further the research into the use of leverage:

- Interest cover ratio – a measure of net income compared to interest costs on debt. The higher the ratio the lower the risk of the company not being able to service its debt. Most South African banks use an interest cover ratio as a covenant condition in loan agreements (SA REIT Association, n.d.). Notably, C. Muller and Ward (2013) investigated interest cover ratios for general equities and found support for theory on companies having an optimal gearing level, however the outperformance occurred between 1987 and 1994 and thereafter there was no sustained evidence of outperformance.
- Average cost of debt – a measure of the average interest rate charged on loans. The lower the rate, the less expensive the cost of debt. A lower cost of debt allows companies to be more competitive when purchasing properties with debt. This metric is often reported by companies and followed by analysts (SA REIT Association, n.d.).

The International Property Databank (IPD) conduct surveys of institutional property companies and report on industry wide trends (IPD South Africa, 2014). Similarly, the Rode's Report surveys commercial property brokers to assess the direct property market (Rode & Associates, 2015). Both reports focus on vacancy levels or occupancy levels by geographic location and sector. To further the current body of academic research this study has included the vacancy percentages of each company's property portfolio to create a new property specific vacancy style. A company's property portfolio's vacancy level is a metric often reported by companies and followed by analysts (SA REIT Association, n.d.).

1.3 Research Motivation

Although, much has been done in the field of style-based effects both internationally and on the JSE, little has been exclusively focused on the South African listed property

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sector. Particularly it has been difficult to research many of the property specific styles in Table 2 in South Africa, as the data required, although of a secondary nature, was not readily available from financial data libraries such as MacGregor BFA and iNET Bridge. A database of the data required was created directly from the financial statements reported by each company and can now be used to assist in the continued academic research into the South African listed property sector.

Table 2: Summary of Styles

Style Category	Style
Momentum	Total Return over 12 Months
Size	Market Capitalisation Median Value Trade over 12 Months Median Value Trade over 12 Months / Market Capitalisation
Value	Earnings Yield or P/E Ratio Dividend Yield Dividend Growth over 12 Months Ratio of Net Asset Value to Price
Property Specific	Leverage or Loan to Value Interest Cover Ratio Average Cost of Debt Geographic Concentration (Gauteng, Western Cape, Other, International) Sector Concentration (Office, Retail, Industrial, Other) Vacancy Percentage of Portfolio

Internationally from an academic perspective there is data to suggest that the returns on real estate exhibit persistence (Bond & Mitchell, 2010). This is important as underlying persistence may point to profitable momentum trading strategies. Kallberg, Liu, and Trzcinka (2000) found that managers can add value through active portfolio management in the REIT sector but they did not find strong evidence of performance persistence.

Partly because of the high growth of the market capitalisation of the property sector, as well as the consistent good performance of the property sector, balanced fund managers and fund of fund managers consider the property sector to be a unique asset class with its own allocation limits (South African Savings Institute, n.d.). This has meant that the property sector is no longer of interest just to specialist property fund managers but also to general equity fund managers and pension fund advisors.

As the sector has grown there has become a business need to better understand the property sector. Anecdotally, property companies and analyst believe that many of the

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variables to be investigated by this study are important metrics to track (SA REIT Association, n.d.). This study will help affirm and debunk which property specific variables show a persistent style, giving business specialist academic grounds as opposed to anecdotal reasons for tracking such metrics. It is also worth noting that should a persistent style exist within the property sector, investors and fund managers will seek to uses such styles-based strategies to outperform the market (C. Muller & Ward, 2013).

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2 Literature Review

2.1 Introduction

According to Rosch and Lloyd (1978) a mechanism of human thought is the process of classification. Barberis and Shleifer (2003) define classifiaction as “the grouping of objects into categories based on some similarity among them” (p.161). Classification is pervasive in financial markets, with investors grouping shares by market capitalisation (large-cap, mid-cap, small-cap and fledgling shares), by sector groupings (resource, financial, property, industrial, etc.) and by value or growth stocks when making portfolio allocations (Bernstein, 1995). According to Barberis and Shleifer (2003) “the asset classes that investors use in this process are sometimes called styles, and the process itself, namely allocating funds among styles rather than among individual securities, is known as ‘style investing’.” (p.162).

Assets in a style typically share a common characteristic and some styles have persistence while other “come and go” e.g. railroad bonds, while new styles may appear as a consequence of financial innovation e.g. mortgage backed securities (Barberis & Shleifer, 2003). Styles may become prominent initially because of superior performance as was the case with the small firm effect discovered by Banz (1981). While other styles may disappear as they are discovered and become prominent, and their performance begins to taper (Barberis & Shleifer, 2003).

According to Barberis and Shleifer (2003) there are at least two reasons why both institutional and individual investors might pursue style investing:

1. Categorisation simplifies choice and enhances efficiency. It is easier to allocate capital to a few styles compared to many equites,
2. Categorisation helps in evaluating performance.

The benefits of style investing are particularly attractive to institutional investors, who have a fiduciary responsibility to follow systematic rules of portfolio allocation.

The Capital Asset Pricing Model (CAPM) of Black (1972), Lintner (1965) and Sharpe (1964) postulates a single variable (market beta) explains the expected return of an equity. Subsequent research has shown one variable to be insufficient and Fama and French (1992) conducted a comprehensive study and identified size (market capitalisation) and value (book-to-market ratios) as additional variables (known as the Fama-French three factor model). Carhart (1997) added momentum as a fourth factor.

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Other researchers have subsequently identified other variables that are associated with price effects, namely dividends, cash-flow and the January effect (C. Muller & Ward, 2013). Similarly, many of these factors have been identified on the JSE (Hoffman, 2012; M. J. Page & Palmer, 1993; M. J. Page, 1996; van Rensburg, 2001).

2.2 Style Variables

2.2.1 Value & Fundamentals Variables

According to Auret and Cline (2011), "A value stock, also known as an out-of-favour stock, is the opposite of a growth stock - one which appears to have significant growth prospects. The value-growth effect is an anomaly which states that value stocks outperform growth stocks" (p. 29).

The outperformance of value stocks has been an area of research both locally and internationally for many years. Basu (1983) found that a price to earnings (P/E) ratio (a value variable) helped explain variations in share returns. Fama and French (1992) tested a number of value and size variables to determine if size and value explain the expected return of an US equities. Fama and French (1992) found that market capitalization (size) and book to market ratios (value) were both significant in explaining the expected return of an US equities. Fama and French (2012) found value explains average share returns in North America, Europe, Japan, and the Asian Pacific.

The value effect, was popularised by Graham and Dodd (1934) concept of value investing where investors purchase companies trading at large discounts to their net asset value (NAV). Klarman (1991) defines value investing as "the strategy of investing in securities trading at an appreciable discount from underlying value," (p. 6) and advocates that value investing "has a long history of delivering excellent investment results with very limited downside risk." (p. 6).

According to Cakici and Tan (2014), "Value and momentum effects documented in the finance literature continue to challenge asset pricing theory" (p. 179). Asness et al. (2013), Chui et al. (2010), Fama and French (2010, 2012) and Hou et al. (2011) all confirmed value and momentum effects in international stock markets. While, Cakici and Tan (2014) found that value and momentum premiums were small in 23 developed international stock markets.

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Although, value variables such as P/E ratios or book to market ratios are common in finance literature, other fundamental variables have been shown to have significance. Da (2009) showed cash flow fundamentals as a key factor in explaining the variation in share returns. Da (2011) showed that analyst forecasted earnings growth over a short period was a predictor of future share returns.

Similar to international research, van Rensburg (2001) examined over 20 style strategies over an 18 year period (1983-1999) on the industrial shares listed on the JSE and determined that all three styles emerged: P/E ratios (value), market capitalisation (size) and past returns (momentum).

Auret and Cline (2011), Auret and Sinclaire (2006), Basiewicz and Auret (2009), Hoffman (2012), C. Muller and Ward (2013), D. Page and Auret (2014), M. J. Page and Palmer (1993), M. J. Page (1996), Strugnell et al. (2011), (2001), van Rensburg and Robertson (2003) and van Rensburg (2001) have found a significant value effect on the JSE.

2.2.2 Size

Banz (1981) investigated the relationship between the market capitalisation (size) and returns of companies listed on the NYSE over the period from 1936 to 1975 and identified the small size effect, also known as “small firm premium”, where stocks with smaller market capitalisations tended to have higher average returns. This contradicts CAPM since large capitalisation shares tended to have larger betas, yet achieved lower average returns than small capitalisation shares (Fama & French, 2012). Banz (1981) suggested that a possible reason for the small size effect is that since little information is known about smaller stocks, and the excess returns were compensation for this lack of information risk, which is not captured by CAPM.

Evidence of the small size effect in the South African market is mixed. Auret and Sinclaire (2006), Basiewicz and Auret (2009), M. J. Page (1996), Strugnell et al. (2011), van Rensburg and Robertson (2003) and van Rensburg (2001) found both a significant size and value effects on the JSE. Auret and Cline (2011), C. Muller and Ward (2013), D. Page and Auret (2014) and M. J. Page and Palmer (1993) found no significant size effect on the JSE. C. Muller and Ward (2013) noted that there was some evidence for fledgling companies, but they only represent less than one percent of the JSE’s market capitalisation. The inconsistency of evidence of the size effect in the South African market could endorse Barberis and Shleifer (2003) that styles

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disappear when they are no longer profitable as a consequence of them being discovered and becoming prominent. C. Muller and Ward (2013) re-examined the styles using an “improved methodology and data set” (p. 1) and argued that the inconsistency of South African studies is because “some of the local studies suffer (to varying degrees) from data related problems: too short time frames, too long review periods, survivor bias, incomplete data and too much emphasis on small thinly traded shares.” (p. 2).

van Rensburg and Robertson (2003) stated that their findings were a clear contradiction to CAPM and found that CAPM beta had a negative relationship with average returns over their sample period. Strugnell et al. (2011) considered the results of van Rensburg and Robertson (2003) and conducted a similar study over a longer time frame and found that beta “is irrelevant as far as return generation on the JSE is concerned.” (p. 15). Strugnell et al. hypothesized that the negative relationship found between beta and average returns in van Rensburg and Robertson (2003) may have been partially due to a methodological bias in estimating beta.

According to Amihud and Mendelson (1986) investors demand compensation for investing in assets that are illiquid. Similar to the small size effect, less liquidity companies tend to have higher average returns, this effect is known as “illiquidity premium”. Amihud, Hameed, Kang, and Zhang (2015) examined illiquidity premium across 45 countries and found positive and significant effects. C. Muller and Ward (2013) analysed value traded as a percentage of market capitalisation, a measure of liquidity, an found the existence of illiquidity premium in the South African markets

2.2.3 Momentum & Behavioural Styles

Behavioural based styles examine share price behaviour, therefore momentum in share price returns and mean reversion of share prices are considered behavioural styles (C. Muller & Ward, 2013). According to D. Page, Britten, and Auret (2013), “The study of momentum and long-term reversal in share returns has become a popular topic in financial economics and adds to the growing body of evidence discrediting the theory of efficient markets and the CAPM” (p. 57). Jegadeesh and Titman (1993) found that strategies investing in previous “winning shares” and selling previous “losing shares” were profitable. Known as the momentum effect, Jegadeesh and Titman (1993) showed that stocks that have done well over the past year tended to continue to do well.

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Momentum has been observed in international markets (Asness et al., 2013; Chui et al., 2010; Fama & French, 2010, 2012; Hou et al., 2011) and in South Africa (C. Muller & Ward, 2013; van Rensburg & Robertson, 2003; van Rensburg, 2001). C. Muller and Ward (2013) found that momentum proved to be the most profitable of all styles examined and that momentum had strong persistence.

According to Novy-Marx (2012), "intermediate horizon past performance, measured over the period from 12 to seven months prior, seems to better predict average returns than does recent past performance. This fact is difficult to reconcile with the traditional view of momentum, that rising stocks tend to keep rising, while falling stocks tend to keep falling, i.e., a short-run autocorrelation in prices" (p. 429). C. Muller and Ward (2013) found that the optimal formation period being 12 months for the JSE over the period 1987-2012.

Momentum has also been shown to have persistence with other assets classes besides general equities. Stevenson (2002) showed the momentum effect in real estate securities.

2.3 Property Sector

Real estate investment trusts (REITs) have experienced very high growth rates over the past 15 years with a substantial increase in the extent of institutional investment in the REIT sector (Hartzell et al., 2010).

Hartzell et al. (2010) adapted the three and four-factor models proposed by Fama and French (1992) and Carhart (1997) in that the construction of the factors are purely based on REITs. Hartzell et al. (2010) also used returns of portfolios sorted by their property type. Although, Hartzell et al. (2010) found a lack of evidence in favour of outperformance, outperformance could be achieved through small cap REITs, including non-REIT securities such as Real Estate Operating Companies (REOCs) and through momentum strategies.

Hartzmark and Solomon (2013) found that companies have positive abnormal returns in months when they are expected to issue a dividend. This anomaly is as large as the value premium, but less volatile (Hartzmark & Solomon, 2013). The premium is consistent with price pressure from dividend-seeking investors (Hartzmark & Solomon, 2013). South African REITs are legally required to pay at least 75% of earnings as a

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divided (SA REIT Association, n.d.) this suggests with a high dividend frequency and yields, South African REITs could exhibit similar anomalies.

Shen, Lu and Lin (2012) suggested "Real estate investment offers stable cash flows and is less correlated with the stock market that proves attractive to investors. Whereas mutual fund investment provides diversification and security selection as less informed investors attempt to benefit from the superior knowledge of fund managers. Consequently, real estate mutual funds which combine both features become a feasible investment alternative." (p. 395).

Kallberg et al. (2000) studied the performance of 44 REIT mutual funds over the period 1986–1998. Using Jensen's alpha to examine the performance of REIT mutual funds Kallberg et al. (2000) found evidence consistent with significant average abnormal performance (net of fees), which they attribute to better performance in down markets. They suggested that this outperformance was due to fund managers' superior management skills and knowledge (Hartzell et al., 2010). Since their abnormal performance presented in the earlier period of their data but not in the later time period, it suggests that the increase in the number of mutual funds and other institutions investing in REITs may have diluted average fund performance (Hartzell et al., 2010).

Unlike other REIT focused studies Cici et al. (2011) examined fund holdings and trading of REIT mutual funds. This approach allowed them to explicitly account for portfolio rebalancing that alters REIT characteristic weights of fund portfolios. Cici et al. (2011) showed that fund managers (after controlling for property type, size and momentum) generated significant positive alpha due to their securities selection ability. To understand the sources of such ability, Cici et al. (2011) examined certain trading using regression analyses but were unable to show that any of the strategies fully explained why fund managers were able to select REITs that outperformed. These trading strategies were based on the styles of geographic concentration of underlying properties, net asset value to price ratios, dividend yield and leverage of the underlying REITs (Cici et al., 2011).

Chiang, Kozhevnikov, Lee and Wisen (2008) focusing closely on the specification of the benchmarking models employed and concluded that there is little evidence of outperformance by REIT mutual funds. Similarly, Shen et al. (2012) showed that neither international REIT mutual funds nor domestic REIT mutual funds possessed market timing abilities. But Shen et al. (2012) did find diversification benefits in

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investing in international REIT mutual funds, yet investors fund flows were driven by return chasing behaviours and fund size, and not for diversification purposes. However Kallberg et al. (2000) indicated that REIT mutual funds can be beneficial to investors both in terms of return and diversification.

Hager and Lord (1985) found that listed property shares behave in similar ways to direct property investment, but that the listed property shares also have many similarities to other investments, such as general equities. Lee and Stevenson (2007) found similarities between REITs and value shares, but also sufficient differences in their return behaviour for them to retain uniqueness for portfolio optimisation. Boudry, Coulson, Kallberg and Liu (2012) found that although REITs have characteristics of stocks and bonds, they also have characteristics with the direct property investments. The hybrid nature of property found by Boudry et al. (2012) emphasises the uniqueness of listed property and when compared to stocks, bonds and direct property. Haß, Johanning, Rudolph and Schweizer (2012) suggest that both direct and listed real estate investments achieve diversification benefits, but each has their own risk and return profiles, with listed real estate having a higher volatility than direct real estate.

2.4 Conclusion

The listed property sector has grown rapidly both in South Africa (iNET Bridge, 2015; Muller & Ward database, 2015) and Internationally (Hartzell et al., 2010) over the last 20 years. Also the South African listed property sector has been one of the top performing asset class over the last 20 years (iNET Bridge, 2015). Interest for academic research focused on the listed property sector has consequently increased, with an understanding that listed property forms its own unique asset class (Boudry et al., 2012).

To further the academic knowledge regarding style-based investment strategies in South Africa, a focus on the listed property sector offers a unique asset class. C. Muller and Ward (2013) found differences between resource and non-resource stocks, suggesting that differences could exists when analysing property stocks. The styles discussed in section 2.2 Style Variables provide a foundation of the main style types that should be investigated together with property specific styles.

When analysing a style, the persistence of the style is important because a style's performance may taper and begin to disappear as they are discovered and become prominent (Barberis & Shleifer, 2003).

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3 Research Questions and Hypotheses

This study aims to accept or reject the overall research question if styles-based strategies, and more specifically strategies using property specific style-based variables, are both profitable and persistent, in the listed property sector on the JSE.

No propositions are stated as the research is well established and the interaction between style-based strategies and share price performance need not be established. The following research questions and hypotheses have been proposed:

3.1 Question 1: Consistency in return when ranking style-based portfolios?

When ranking style-based portfolios into three-quantiles (terciles), namely high (tercile one), medium (tercile two) and low (tercile three), is their consistency in each portfolios return and are the portfolios significantly different from each other?

This research question can be expressed with the following hypothesis:

3.1.1 Hypothesis 1

- The Null hypothesis states that the average sample return of the high style-based portfolio is equal to the average sample return of the medium style-based portfolio which is also equal to the average sample return of the low style-based portfolio at a 5% level of significance.
- The Alternative hypothesis states that average sample returns of the high style-based portfolio, medium style-based portfolio and low style-based portfolio are not equal at a 5% level of significance (suggesting that a ranking does exist, but does not determine the order of such ranking).

Hypothesis one can be expressed as follows:

$$H1_{Null}: \mu_{High\ portfolio,\ Style\ i} = \mu_{Medium\ portfolio,\ Style\ i} = \mu_{Low\ portfolio,\ Style\ i}$$

$$H1_{Alternative}: \mu_{High\ portfolio,\ Style\ i} \neq \mu_{Medium\ portfolio,\ Style\ i} \neq \mu_{Low\ portfolio,\ Style\ i}$$

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Where:

- *High, Medium and Low portfolio* represents the three style-based portfolios ranked into tercile one, tercile two and tercile three, respectively. It is anticipated that in some cases the return for tercile three should outperform that of a tercile one.
- *Style i* represents the 22 different types of style-based portfolios to be investigated based on their style variables, as detailed in Table 3

Table 3: Styles Variables

No.	Variable	Description / Formula
1	Momentum	Total Return over 12 Months, consistent with Carhart (1997) and C. Muller and Ward (2013)
2	Size (Market Capitalisation)	Market Capitalisation, consistent with Fama and French (1992) and C. Muller and Ward (2013)
3	Value Traded	Median Value Trade over 12 Months
4	Value Traded / Market Capitalisation	Median Value Trade over 12 Months / Market Capitalisation, consistent with C. Muller and Ward (2013)
5	Value (Earnings Yield)	Earnings Yield or P/E Ratio, consistent with Fama and French (1992) and C. Muller and Ward (2013)
6	Dividend Yield	Dividend Yield, it is worth noting that although dividend yield is related to the Earnings Yield, property companies earnings are impacted by underlying property revaluations (a non-cash flow item) while dividend yields are more reflective of cash flow movements, consistent with Da (2009), Cici et al (2011) and C. Muller and Ward (2013).
7	Dividend Growth	Dividend Growth over 12 Months. This raises the question of do fundamental ratios contain momentum
8	Price to NAV	Ratio of Price to Net Asset Value, consistent with Cici et al (2011) and C. Muller and Ward (2013).
9	Loan to Value	Interest Bearing Debt / Property Assets, consistent with Cici et al (2011).
10	Interest Cover Ratio	Interest Cost / Net Rental Income, consistent with C. Muller and Ward (2013)
11	Average Cost of Debt	Average Cost of Debt, as reported in company financials.
12	Total Geographic Concentration	Standard Deviation of Percentage allocations in Geographic variables, consistent with Cici et al (2011).

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13	Geo: Gauteng Percentage	Percentage of Portfolio in Gauteng, as reported in company financials.
14	Geo: Western Cape Percentage	Percentage of Portfolio in Western Cape, as reported in company financials.
15	Geo: South Africa Other Percentage	Percentage of Portfolio in Other, as reported in company financials.
16	Geo: International Percentage	Percentage of Portfolio Internationally, as reported in company financials.
17	Total Sector Concentration	Standard Deviation of Percentage allocations in Sector variables
18	Sector: Office Percentage	Percentage of Portfolio in Office, as reported in company financials.
19	Sector: Retail Percentage	Percentage of Portfolio in Retail, as reported in company financials.
20	Sector: Industrial Percentage	Percentage of Portfolio in Industrial, as reported in company financials.
21	Sector: Other Percentage	Percentage of Portfolio in Other Sectors, as reported in company financials.
22	Vacancy Percentage of Portfolio	Percentage of Portfolio Vacant, as reported in company financials.

3.2 Question 2: Are style-based portfolios profitable compared to the market portfolio?

When comparing the best performing style-based portfolio with the market portfolio are the portfolios significantly different from each other.

This research question can be expressed with the following hypothesis:

3.2.1 Hypothesis 2

- The Null hypothesis states that the average sample return of the best performing style-based portfolio is equal to the average sample return of the market portfolio at a 5% level of significance.
- The Alternative hypothesis states that average sample return of the best performing style-based portfolio and the average sample return of the market portfolio are not equal at a 5% level of significance.(suggesting that a ranking does exist, but does not determine the order of such ranking).

Hypothesis two can be expressed as follows:

$$H2_{Null}: \mu_{Best\ performing\ \ portfolio\ ,\ \ Style\ i} = \mu_{Market\ \ portfolio}$$

$$H2_{Alternative}: \mu_{Best\ performing\ \ portfolio\ ,\ \ Style\ i} \neq \mu_{Market\ \ portfolio}$$

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3.3 Question 3: Is there persistence in return between High and Low ranked style-based portfolios?

When comparing a high style-based portfolio (tercile one) and a low style-based portfolio (tercile three), is the difference in return because of multiple periods of outperformance or rather because of a singular period of outperformance?

This is to determine the persistence of the return difference of the portfolios and can be graphically represented with the following ratio:

$$\frac{P_{High\ portfolio,\ Style\ i}}{P_{Low\ portfolio,\ Style\ i}} \quad \ldots \text{Equation 1}$$

It is noted that the price of the high style-based portfolio must be consistently growing at greater rate than the price of the low style-based portfolio over the total period of investigation for the style to have persistence.

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4 Research Methodology and Design

4.1 Methodology

The study aimed to examine the effects of style-based strategies in predicting the returns of listed property shares on the JSE. The effects were measured in terms of the returns of portfolios constructed by selected styles, this is in line with current literature (C. Muller & Ward, 2013).

To ensure research was comparable with previously studied style-based strategies on the JSE, the methodology was based on that of C. Muller and Ward (2013) whom examined style-based strategies on the JSE over the 27 year period from 1985 to 2011. Where possible the same database, updated with current data, and the same style-engine was used for this study. Only where necessary was property specific data added to the database and the style-engine was adapted to handle the new data. The study examined style-based strategies on the listed property shares on JSE over the 20 year period from 1995 to 2015.

4.2 Research Design

The research design was quantitative as this best suited this type of study and followed an exploratory approach since the objective of the study was to understand the relationship between styles and share price returns (Saunders, Lewis, & Thornhill, 2012). The results were presented and analysed using a graphical time series approach, as was done by C. Muller and Ward (2013), to answer research question one, two and three. Hypothesis one and two were tested quantitatively using a Friedman test to determine statistical significant differences between the portfolios relative to each other and the market portfolio.

The Friedman test is a non-parametric statistical test developed by Friedman (1937). It is used to detect differences across multiple test attempts and can be used as an alternative for a single-factor, repeated measures ANOVA when sample groups are not normally distributed (Daniel, 1990). According to Patton and Timmermann (2007), traditional research approaches to test significance of portfolio returns in these types of studies have used t-tests, however this would assume that the portfolios' returns have unimodal normal distributions and that the portfolios have unequal variances. Both assumptions did not hold for the data, hence the Friedman test was used instead of t-tests. The Friedman test can produce dependable results regardless of the distribution

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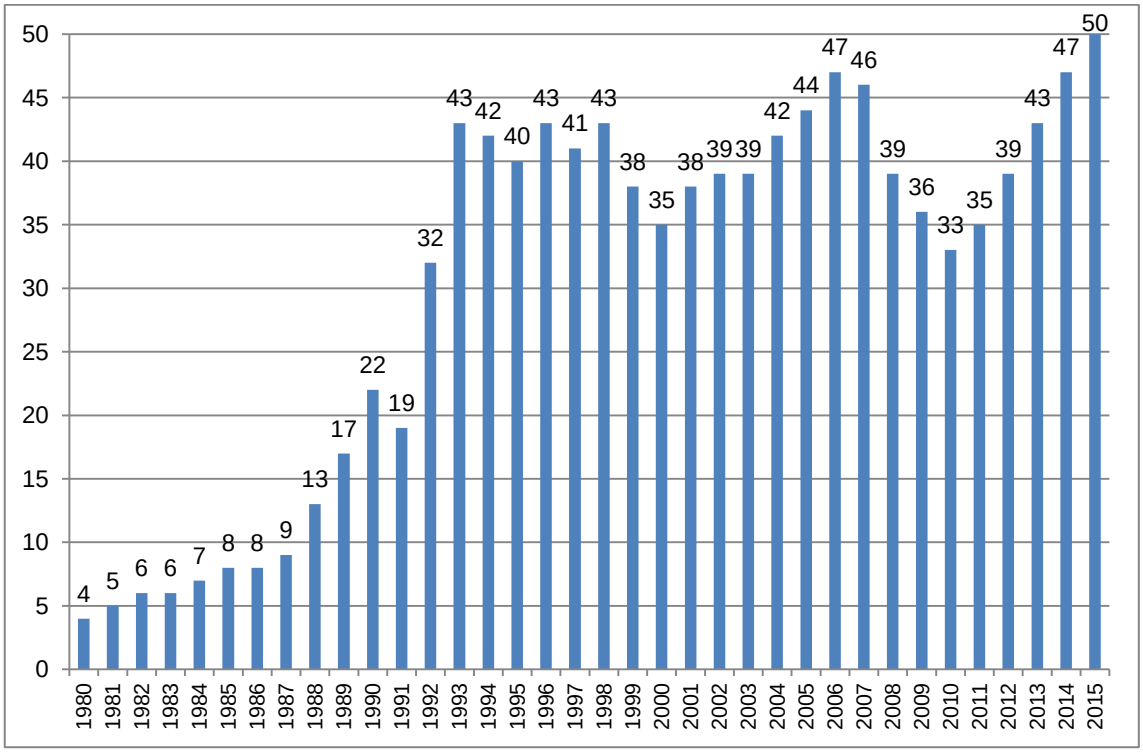
as it uses a procedure of ranking each row (or block). This also ensures that outliers are not a concern as the Friedman test 'thinks' in terms of the median and not the mean (Daniel, 1990).

4.3 Population

The population for this research was all South African listed property companies over the period December 1995 to December 2015, comprising a 20 year time period. A sampling frame exists for all companies that are listed as property companies on the JSE. A comprehensive list of the 118 ticker codes making up the population of property companies is detailed in Table 4. It is worth noting that some listed property companies may have multiple ticker codes representing different classes of shares e.g. AWA and AWB. Also companies may have changed their corporate structure and ticker code during the period e.g. RIN and RPL.

The time period was selected as prior to December 1995 the number and liquidity of listed property companies on the JSE was too small and illiquid to be meaningful (see Figure 3). The most recent period for which the data was available when the models were run was 4 December 2015.

Figure 3: Number of Listed Property Companies on the JSE from 1980-2015



source: (iNET Bridge, 2015)

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The market portfolio that was used was an equal weighted index of the largest 160 equities ranked by market capitalisation listed on the JSE, reweighted quarterly, consistent with the research done by C. Muller and Ward (2013). Although there are typically more than 350 companies listed on the JSE, the All Share Index comprises only the largest 160 companies, but represents around 99% of the total market capitalisation of the JSE (C. Muller & Ward, 2013).

A key consideration when processing the data is survivorship bias which can be a significant issue (Gilbert & Strugnell, 2010). To mitigate this risk all property companies in the month when they are listed were included into the data set and any companies that were delisted were removed as they occurred.

Table 4: Population of all Listed Property Tickers on JSE from 1995-2015

Ticker Code	Name	Nature of Business	Listing Date	Status
ABT	Ambit Properties Ltd	Real Est Hold	06-Feb-04	Delisted
ABY	Abbey Holdings Limited	Property	08-Jul-85	Delisted
ACP	Acucap Properties Ltd	Retail Reits	08-Apr-02	Delisted
ACS	Acsion Limited	Real Estate Holding & Dev	09-Dec-14	Delisted
ADV	Advent Properties Ltd	Property Loan Stock	18-Dec-91	Delisted
AIA	Ascension Prop Ltd A	Diversified Reits	15-Jun-12	Listed
AIB	Ascension Prop Ltd B	Diversified Reits	15-Jun-12	Listed
ANP	Annuity Properties Ltd	Diversified Reits	04-May-12	Delisted
APA	Apexhi Properties -A-	Real Est Hold	05-Mar-01	Delisted
APB	Apexhi Properties -B-	Real Est Hold	30-Nov-01	Delisted
APF	Accelerate Prop Fund Ltd	Retail Reits	12-Dec-13	Listed
ARO	Anglo American Properties Ltd	Property	31-Jan-78	Delisted
ATS	Atlas Properties Ltd	Real Est Hold	16-Jun-88	Delisted
ATT	Attacq Limited	Real Estate Holding & Dev	14-Oct-13	Listed
AWA	Arrowhead Properties A	Industrial & Office Reits	09-Dec-11	Listed
AWB	Arrowhead Properties B	Industrial & Office Reits	09-Dec-11	Listed
AXC	Apexhi Properties -C-	Real Est Hold	09-Oct-06	Delisted
BNT	Bonatla Property Hldgs	Real Estate Holding & Dev	24-Oct-97	Delisted
BPP	Barprop Ltd	Property Loan Stock	30-Jun-98	Delisted
BPR	Barprop Ltd	Property Loan Stock	02-Oct-85	Delisted
BST	Bester Beleggings Beperk	Property	31-Jan-78	Delisted
CBD	Cbd Property Fund	Property Unit Trusts	31-Dec-81	Delisted
CBS	Cbs Property Portfolio	Real Est Hold	02-Nov-05	Delisted
CCO	Capital&Counties Prop Plc	Real Estate Holding & Dev	10-May-10	Listed
CEN	Centrecity Property Fu	Real Est I	31-Dec-80	Delisted
CLO	Calulo Property Fund Ltd	Real Est Hold	08-Mar-04	Delisted
CPF	Capital Property Fund Ltd	Industrial & Office Reits	31-Aug-84	Listed

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CPS	Compass Property Holdings	Property	04-Jul-88	Delisted
DIA	Dipula Income Fund A	Diversified Reits	19-Aug-11	Listed
DIB	Dipula Income Fund B	Diversified Reits	19-Aug-11	Listed
DIV	Diversified Prop Fund Ld	Real Est Hold	06-Oct-05	Delisted
DLI	Delta Int Prop Hldg Ltd	Real Estate Holding & Dev	31-Aug-12	Listed
DLT	Delta Property Fund Ltd	Industrial & Office Reits	02-Nov-12	Listed
DSA	Disa Development Corporation	Property	23-Oct-87	Delisted
EMI	Emira Property Fund	Diversified Reits	28-Nov-03	Listed
EQR	Equikor Holdings Ltd	Property	16-Jul-85	Delisted
EQU	Equites Prop Fund Ltd	Industrial & Office Reits	18-Jun-14	Listed
FDP	Freedom Prop Fund Ltd	Real Estate Holding & Dev	12-Jun-14	Listed
FFA	Fortress Inc Fund Ltd A	Diversified Reits	22-Oct-09	Listed
FFB	Fortress Inc Fund Ltd B	Diversified Reits	22-Oct-09	Listed
FPT	Fountainhead Prop Trust	Retail Reits	30-Jun-83	Listed
FSP	Freestone Property Hldgs	Real Est Hold	30-Aug-01	Delisted
FVT	Fairvest Property Hldgs	Retail Reits	25-May-98	Delisted
GPR	Grove Property Fund Ltd	Property Loan Stock	13-Sep-85	Delisted
GRT	Growthpoint Prop Ltd	Diversified Reits	30-Nov-87	Listed
HGT	Higate Property Fund	Property Unit Trusts	30-Nov-87	Delisted
HPA	Hospitality Prop Fund A	Specialty Reits	16-Feb-06	Listed
HPB	Hospitality Prop Fund B	Specialty Reits	16-Feb-06	Listed
HST	Highstone Property Fund	Property Unit Trusts	20-Sep-90	Delisted
HYP	Hyprop Inv Ltd	Retail Reits	25-Feb-88	Listed
IAP	Investec Australia Prop Fd	Industrial & Office Reits	24-Oct-13	Listed
IFR	Ifour Properties Ltd	Real Est Hold	18-Jun-02	Delisted
ILU	Indluplace Properties Ltd	Residential Reits	19-Jun-15	Listed
ING	Ingenuity Property Inv	Real Estate Holding & Dev	02-Jul-01	Listed
IPF	Investec Property Fund Ltd	Diversified Reits	15-Apr-11	Listed
IPR	Iprop Holdings Ltd	Property	27-Nov-87	Delisted
ITU	Intu Properties Plc	Retail Reits	24-Jun-99	Listed
KHO	Kirchmann-Hurry Properties	Property	28-Sep-90	Delisted
LDO	Lodestone Reit Limited	Diversified Reits	25-Feb-15	Listed
MCP	Micc Property Income Fnd	Real Est Hold	09-Oct-03	Delisted
MDN	Madison Prop Fund Mngrs	Real Est Hold	07-Jun-06	Delisted
MIL	Millennium Property Holdings	Property Loan Stock	11-Dec-86	Delisted
MIP	Merchant & Ind Prop Ltd	Real Estate Holding & Dev	26-Feb-90	Delisted
MNO	Main Street Property Fund	Property Unit Trusts	23-Jan-91	Delisted
MPL	Metboard Properties Lt	Real Est H	22-May-98	Delisted
MSP	Mas Real Estate Inc.	Real Estate Holding & Dev	31-Aug-09	Listed
MTP	Martprop Property Fund	Real Est I	03-Nov-99	Delisted
MYT	Monyetla Property Fund Ltd	Real Est Hold	07-May-07	Delisted
NEP	New Europe Prop Inv Plc	Real Estate Holding & Dev	17-Apr-09	Listed
NFP	New Frontier Prop Ltd	Real Estate Holding & Dev	08-Apr-15	Delisted
NPT	Newport Property Fund	Property Unit Trusts	11-Jan-94	Delisted
NVT	Nk Properties Ltd	Property Loan Stock	30-Jan-96	Delisted
OAS	Oasis Crescent Prop Fund	Retail Reits	23-Nov-05	Listed

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OCT	Octodec Invest Ltd	Retail Reits	26-Sep-90	Listed
ORE	Orion Real Estate Ltd	Real Estate Holding & Dev	18-Aug-03	Listed
PAP	Pangbourne Prop Ltd	Real Estate Holding & Dev	23-Jul-87	Delisted
PFN	Consolidated Property And Fin	Real Est Hold	04-Feb-85	Delisted
PIC	Picardi Properties Limited	Property	21-Jan-85	Delisted
PIV	The Pivotal Fund Ltd	Real Estate Holding & Dev	08-Dec-14	Listed
PMG	Primegro Properties Ltd	Property	17-Jan-00	Delisted
PMM	Premium Properties Ltd	Diversified Reits	27-Jun-95	Delisted
PNR	Pioneer Property Fund	Property Unit Trusts	31-Jan-78	Delisted
PPR	Putprop Ltd	Real Estate Holding & Dev	14-Aug-89	Listed
PRA	Paramount Prop Fund Ltd	Real Est Hold	14-Mar-89	Delisted
PRM	Prima Property Trust	Real Est I	31-Jan-78	Delisted
QPG	Quantum Prop Group Ltd	Real Estate Holding & Dev	13-Oct-08	Listed
RAB	Rabie Investment Holdings Ltd	Property	04-Aug-89	Delisted
RDF	Redefine Properties Ltd	Diversified Reits	17-Jul-00	Listed
REB	Rebosis Property Fund Ltd	Diversified Reits	17-May-11	Listed
RES	Resilient Prop Inc Fund	Retail Reits	06-Dec-02	Listed
RHW	Richway Retail Prop Ltd	Real Est Hold	05-Jul-94	Delisted
RIN	Redefine Prop Int Ltd	Real Estate Holding & Dev	07-Sep-10	Delisted
ROC	Rockcastle Global Real Estate	Real Estate Holding & Dev	26-Jul-12	Listed
RPL	Redefine International P.L.C	Diversified Reits	28-Oct-13	Listed
RPR	Rand Leases Properties Ltd	Property	26-Feb-92	Delisted
SAC	Sa Corp Real Estate Fund	Retail Reits	11-Dec-06	Listed
SAR	Safari Investments Rsa Ltd	Retail Reits	07-Apr-14	Listed
SBL	Sable Holdings Ltd	Real Estate Holding & Dev	30-Nov-83	Delisted
SGA	Synergy Inc Fund Ltd A L/U	Retail Reits	19-Dec-11	Listed
SGB	Synergy Inc Fund Ltd B L/U	Retail Reits	21-Dec-11	Listed
SGR	Sage Property Holdings	Property	25-May-88	Delisted
SJL	S And J Land Holdings	Real Estate Holding & Dev	05-Dec-95	Delisted
SMP	Saambou Properties Limited	Property	02-Aug-91	Delisted
SNL	Sanland Property Trust	Property Unit Trusts	31-Jan-78	Delisted
SPE	Spearhead Prop Hldgs Ltd	Real Est Hold	10-Nov-99	Delisted
SRE	Sirius Real Estate Ltd	Real Estate Holding & Dev	05-Dec-14	Listed
SRL	Sa Retail Properties Ltd	Real Est Hold	03-Dec-01	Delisted
STP	Stenprop Limited	Real Estate Holding & Dev	12-Dec-14	Listed
SYA	Siyathenga Property Fund	Real Est Hold	08-Aug-05	Delisted
SYC	Sycom Property Fund	Retail Reits	25-Nov-86	Listed
TAM	Tamboti Property Fund	Property Unit Trusts	25-Jun-86	Delisted
TEX	Texton Property Fund Ltd	Diversified Reits	12-Aug-11	Listed
TMK	Tomkor Ltd	Property	30-Nov-83	Delisted
TWR	Tower Property Fund Ltd	Diversified Reits	19-Jul-13	Listed
UMN	Umdoni Property Fund	Property Unit Trusts	31-Oct-83	Delisted
VIF	Vividend Income Fund Ltd	Diversified Reits	18-Nov-10	Delisted
VIS	Visual International Hldgs Ltd	Real Estate Holding & Dev	23-May-14	Delisted
VKE	Vukile Property Fund Ltd	Retail Reits	24-Jun-04	Listed

source: (iNET Bridge, 2015; MacGregor BFA, 2015; Muller & Ward database, 2015)

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4.4 Sampling Method

In order to control for liquidity concerns a liquidity screen was applied to the data to ensure that companies that were too illiquid for institutional investors were removed. To test for liquidity the population of property companies as detailed in Table 4 were checked to see if their median daily value traded over a period of 12 months was larger than a deflation adjusted one million Rand value.

The median, instead of the mean, was used as this reduces concerns around outliers, so as to reflect a more representative value of shares that were traded on a daily basis in each company. The one million Rand value was chosen by convenience to ensure that the most liquid 20 property companies by market capitalisation would be considered for this study. The FTSE/JSE SA Listed Property Index (J253T) constitutes the largest 20 property companies by market capitalisation and many property specific institutional investor mandates restrict them from only investing in constituents of this benchmark index. As the property sector has grown so has the daily value traded, so one million Rand value today would have been far smaller in 1995, to cater for this the one million Rand value was deflated conveniently by 20% each year to try and ensure that the most liquid 20 property companies in 1995 were included. This is in line with the fact that over the last ten years the property sector has generated a 21.1% annualised return. The FTSE/JSE SA Listed Property Index (J253T) constituents were not used because the index was only created in 2002 and this study started in 1995, it is also worth noting that some of the smaller FTSE/JSE SA Listed Property Index (J253T) constituents did not always meet the liquidity screen over the period of the study. A liquidity screen rather than a size screen was used to ensure that the study did not suffer from too much emphasis on thinly traded shares, as has been the case with many other South African studies (C. Muller & Ward, 2013).

The liquidity screening meaningfully reduced the number of eligible counters to be used in the style-engine in the early years of the study period, specifically from 1995 till 2003. This can be seen in Figure 4 were the style variable vacancy percentage of portfolio only began to have four constituents per each tercile by early 2004. Also, some variables were not reported by companies during the early years of the study period, this meant that some results during these early periods for some styles need to be understood with respect to the number of constituents in each portfolio (tercile). Specifically, many listed property companies only started to use leverage in the early 2000s, as legislation prevented PUTs from using debt. This can be seen in Figure 5 were the style loan to value was not relevant between 1995 and 2000 as such the

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style-engine was only able to find one or two companies with leverage during this initial period. A graphical representation of the number of constituents per each portfolio for all 22 styles can be found in APPENDIX A: Number of Constituents per a Portfolio.

Figure 4: Number of Constituents per Portfolio (tercile) for Vacancy Percentage Style

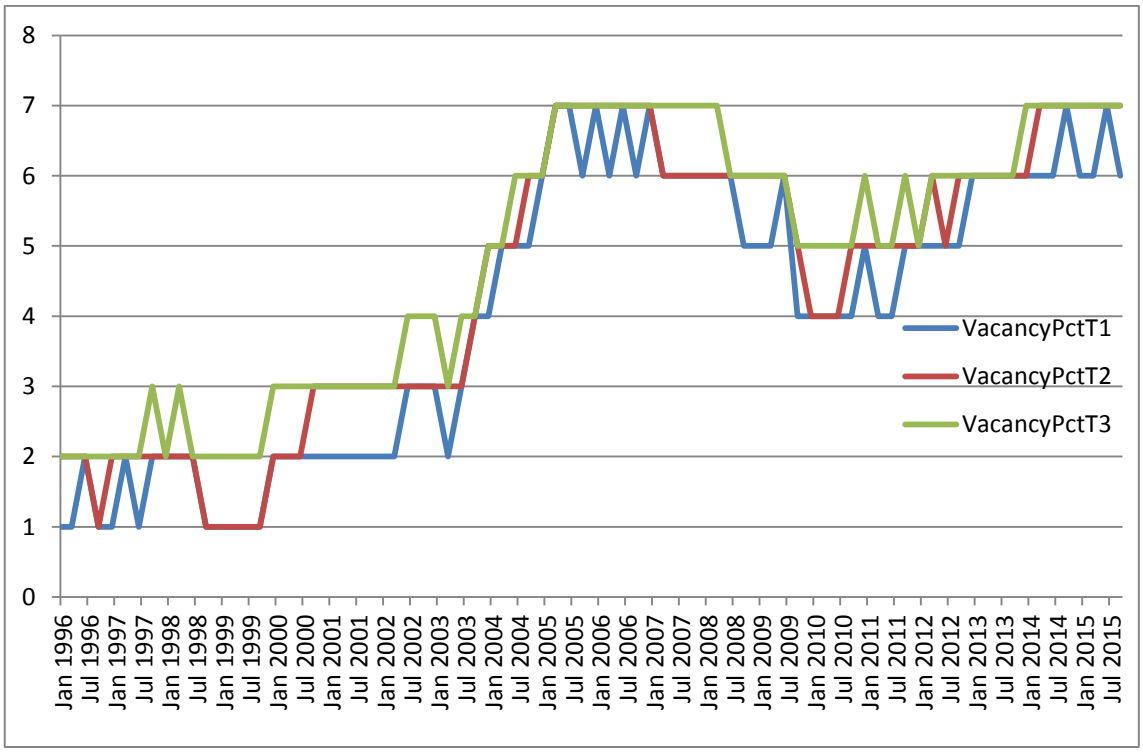
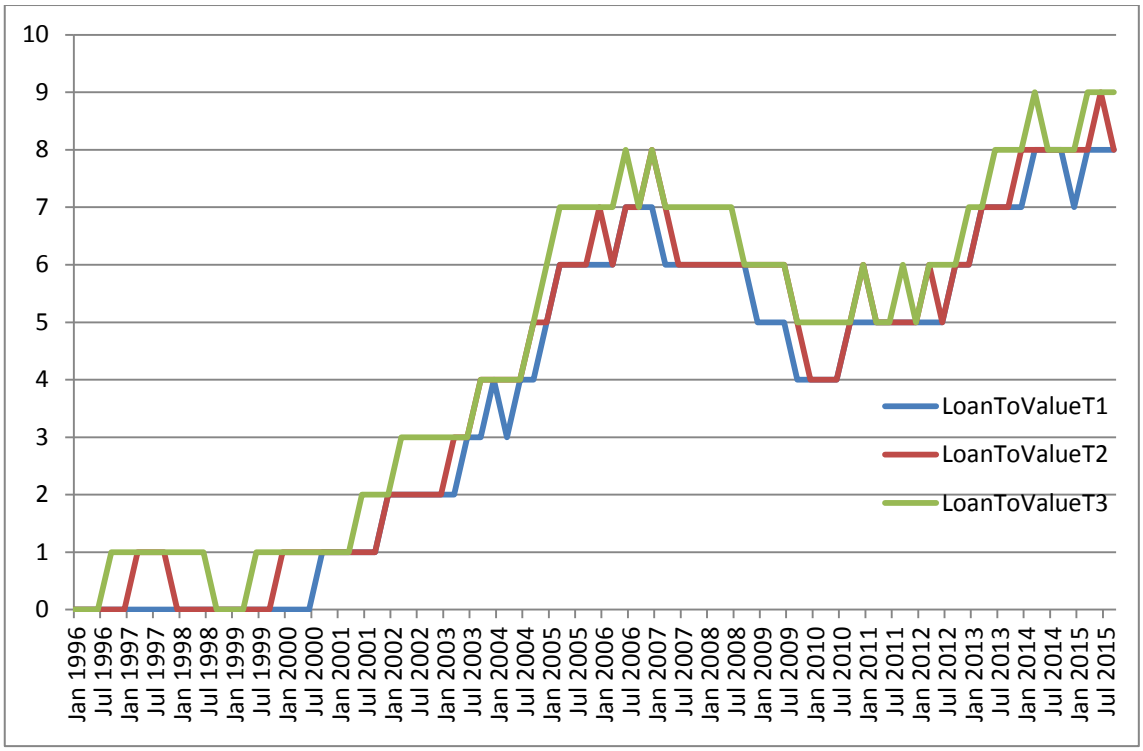


Figure 5: Number of Constituents per Portfolio (tercile) for Loan to Value Style



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4.5 Measurement Instrument

4.5.1 The Style-engine

The same style-engine used by C. Muller and Ward (2013) was used to process the data. The style-engine is constructed in Excel, using VBA code to manipulate data from an Access database. The style-engine was created with parameterised inputs, to facilitate the easily changing of settings and styles. The style-engine enabled simple selection of start date (31 December 1995), end date (4 December 2015), number of portfolios required (three terciles), the portfolio review or rebalancing period (three months).

The style-engine ignored transaction costs relating to the quarterly portfolio rebalancing as they would be approximately the same between portfolios and immaterial (C. Muller & Ward, 2013). According to Mutooni and Muller (2007), neglecting transaction costs would overstate return results and changing the rebalancing period to monthly compared to quarterly would increase this overstatement error. However for this study since each portfolio would be impacted in a similar manner and the relative return and not the absolute return for each portfolio was important, transaction cost could be ignore.

Survivorship bias can be a significant issue for many studies (Gilbert & Strugnell, 2010). The style-engine included newly listed shares at the start of each new quarter and dropped delisted shares at the end of the quarter using their last traded price (C. Muller & Ward, 2013). Name changes were tracked provided the company structure had not changed e.g. CPF and CPL were considered the same share, as the company changed its name. While RIN and RPL were treated as two different shares, as the company changed its corporate structure.

The style-engine was able to handle for spin-offs or unbundling by including the returns of the newly listed subsidiary with the original holding company for the remainder of the quarterly review period, and thereafter treat both companies as separate entities (C. Muller & Ward, 2013). The style-engine, however did not handle for rights issues and nil paid letters of allocation (rights to acquire new shares in the company at a predetermined level). Over the period there would have been 28 instances of rights issues (not all of which would have impacted the portfolios). Rights issues in the listed property sector are usually at a marginal discount to market values and could arbitrarily affect the different portfolios equally; therefore it is unlikely that by ignoring rights

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issues that the study's results was significantly impacted. Dividends where carefully handled by the style-engine to also include both cash and scrip dividends.

According to C. Muller and Ward (2013), "A pervasive problem in research of this nature is the so called "look ahead bias" in the data. Financial statement data is typically included in the database and indexed on the financial year-end date of the company. However, most companies are only able to release final audited figures some weeks or months after their official year-end date (the JSE allows up to three months for this). Consequently, when conducting research using historical accounting data, it is important to acknowledge that the share prices (usually) do not reflect this information at the financial year-end date." (p. 3). To solve this problem the style-engine lagged any accounting variables used by three months post their financial year-end date, so as to only be considered after reporting date.

4.5.2 Portfolio Construction

The style-engine was used to construct three equally weighted share portfolios based on their ranking of their style variables at each quarter. Figure 6 graphically depicts the process required to construct the portfolios.

Firstly, the Muller & Ward database (2015) which includes all share price data was restricted by the listed property companies as per Table 4 to create the population of only JSE listed property companies. Then at each quarter rebalance the population underwent the liquidity screening as detailed in 4.4 Sampling Method.

The remaining companies were then sorted and ranked according to the style variable that was being analysed. Based on the ranking at each quarter three equally weighted portfolios were constructed. Each portfolio was created as a tercile of the companies that met the criteria i.e. if there were 21 companies that met the screening and had sufficient data for the style ranking; then each portfolio would have had seven constituents. Alternatively, if only 19 companies met the criteria; then tercile three (low) would have seven constituents while tercile two (medium) and tercile one (high) would have had six constituents each. See APPENDIX A: Number of Constituents per a Portfolio for a graphical representation of the number of constituents per each portfolio for all 22 styles. Each constituent was equally weighted in the portfolio.

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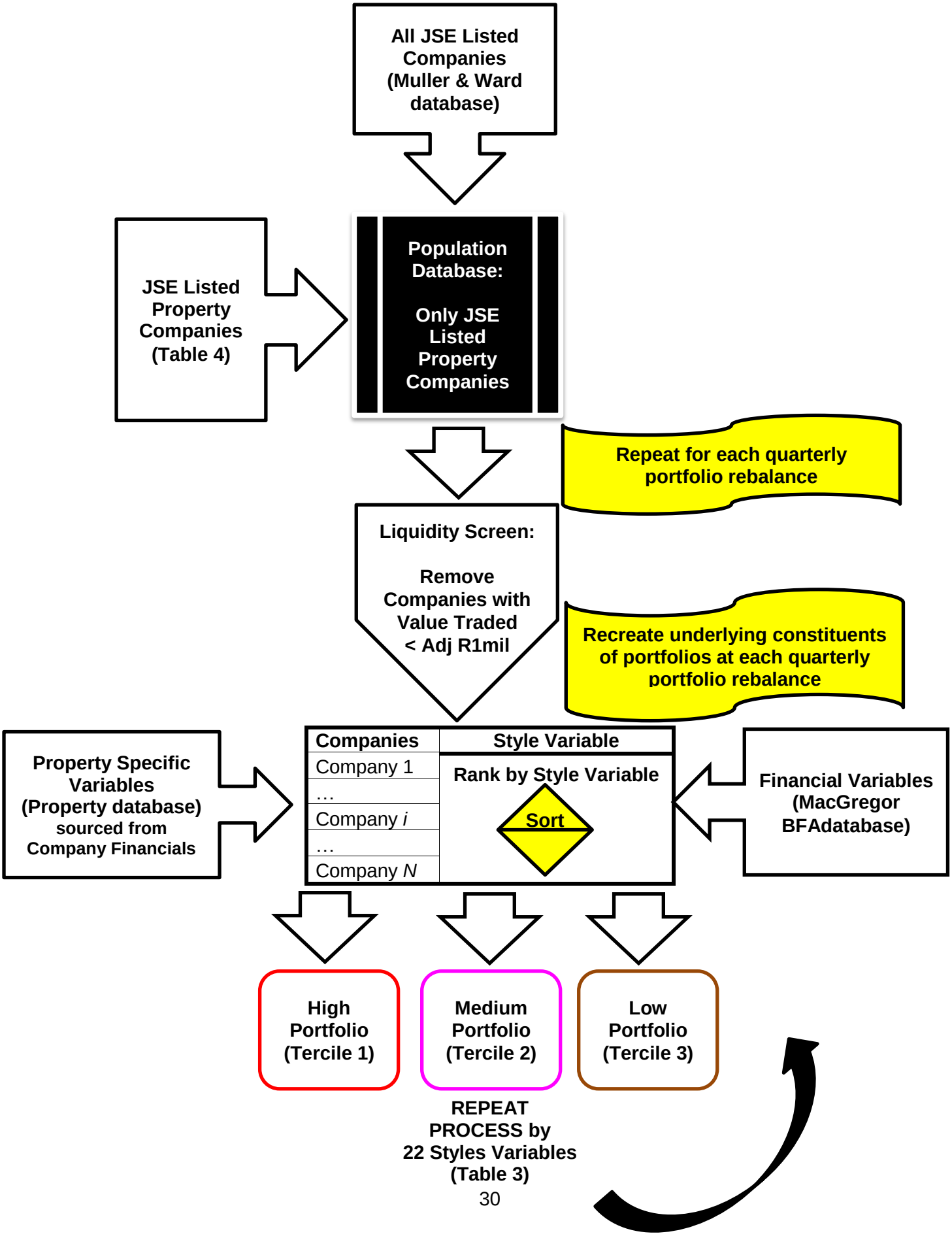
Figure 6: Portfolio Construction Process Diagram



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Each of the constituents returns were then calculated to create the portfolios returns over the quarter. After holding the portfolios for the quarter the shares within the portfolios would be adjusted according to their new ranking. This process was repeated at the end of each quarter to reconstitute the underlying constituents of each portfolio and to then accumulate the value of the portfolio over the period of investigation until 4 December 2015. The final result was a monthly time series of portfolio values for the high (tercile one), medium (tercile two) and low (tercile three). The whole process was repeated for the 22 style variables in Table 3 to create the three portfolios for each style.

The market portfolio was constructed in a similar manner, by creating an equally weighted index of the largest 160 equities ranked by market capitalisation listed on the JSE using a quarterly reweighting, this is consistent with the research done by C. Muller and Ward (2013).

4.6 Data Gathering

This research study relies entirely on secondary data which is sufficient to answer the research questions and address the specific population under investigation. Three databases were used to source the data.

For share price, value traded, market capitalisation, earnings and dividend data was sourced from the Muller & Ward database (2015). This is the same database used by C. Muller and Ward (2013) but updated with the most current available data up until December 2015. The data in this database was obtained from iNET Bridge and was checked for data errors and for price movements larger than 40% (C. Muller & Ward, 2013). Notably, C. Muller and Ward (2013) were able to reconstruct the FTSE/JSE Africa All Share Index - J203T to test the robustness and data integrity of this database. Share splits and consolidations that caused changes in share prices were backward adjusted in the database.

For company income statement and balance sheet financial data MacGregor BFA (2015) was used. Data was imported from MacGregor BFA's website into an Access database to assist in easier manipulation and error checking of the data. When whole date periods contained zeros (column), the date was removed from the database. This error often occurred when companies changed their financial year end during a period e.g. GRT in 1992 changed its year end to 31 March from 31 October. To ensure consistency with the Muller & Ward database (2015) the same ticker codes were used

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in both databases; this specifically meant that name and ticker code changes needed to be dealt with in the same manner e.g. CPF needed to be updated to include the CPL data in the database.

For property specific data, such as geographic concentration, although of a secondary nature, was not readily available from financial data libraries such as MacGregor BFA (2015) and iNET Bridge (2015). A new property database was created directly from the annual financial statements reported by each company. The annual financial reports were sourced from MacGregor BFA (2015). Since the data was historic and represented company reported data there was little risk of biasing. But the data was captured manually and there was risk of a data capturing error.

Reporting standards have changed over the period of the study and since for much of the property specific data there has not always been a regulatory requirement by companies to report such data, some subjectivity was required when capturing some of the earlier data. For example, most companies report on the geographic percentage of the portfolio, but this can be reported in three different ways: by gross lettable area (GLA), by value of the property (value), or by income from the property (income). Today most companies will provide all three measures, but historically companies may have reported on only one or two of the measures. To reduce the risk of subjectivity the most common and appropriate measure was chosen, by income, if this was not available then by value and only if both other measures were not provided was by GLA used. The researcher captured all data to ensure that consistency was applied and that the most appropriate value was captured while considering the overall research study.

Each of the 22 style variables is listed in Table 5 detailing which databases were required and the formula and database codes used to create the style variable.

4.7 Unit of Analysis

The unit of analysis to answer the research questions was the cumulative portfolio returns from the graphical times series. The order, magnitude of difference and persistence of the portfolio cumulative returns were analysed. The unit of analysis for the hypothesis test was the lognormal monthly return for each portfolio. According to Hull (2000), “The lognormal property of stock prices can be used to provide information on the probability distribution of the continuously compounded rate of return …“ (p.239).

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Table 5: Database Codes to create Styles Variables

No.	Style Variable	Database Required	Formula / Database Codes	Comment
1	Momentum	Muller & Ward database	TotalReturn[-365]	Total Return over 12 Months
2	Size (Market Capitalisation)	Muller & Ward database	MarketCap[]	Market Capitalisation
3	Value Traded	Muller & Ward database	ValueTradeDailyMedian[]	Median Value Trade over 12 Months
4	Value Traded / Market Capitalisation	Muller & Ward database	ValueTradeDailyMedian[] / MarketCap[]	Median Value Trade over 12 Months / Market Capitalisation
5	Value (Earnings Yield)	Muller & Ward database	EarningsYield[]	Earnings Yield
6	Dividend Yield	Muller & Ward database	DividendYield[]	Dividend Yield
7	Dividend Growth	Muller & Ward database	(DividendYield[] * Price[]) / (DividendYield[-365] * Price[-365])	Dividend Growth over 12 Months
8	Price to NAV	MacGregor BFA database Muller & Ward database	= MarketCap[] / ([01010009] + [01010022])	Ratio of Price to Net Asset Value
9	Loan to Value	MacGregor BFA database	=([01010021] + [01010023] + [01010032] - [01010028] - [01010029]) / ([01010020])	Interest Bearing Debt / Property Assets
10	Interest Cover Ratio	MacGregor BFA database	=[01020085] / ([01020074] - [01090373])	Interest Cost / Net Rental Income
11	Average Cost of Debt	Property database	D4001 (Database code)	Average Cost of Debt
12	Total Geographic Concentration	Property database	G1001 (Database code)	Standard Deviation of Percentage allocations in Geographic variables
13	Geo: Gauteng Percentage	Property database	G1002 (Database code)	Percentage of Portfolio in Gauteng
14	Geo: Western Cape Percentage	Property database	G1003 (Database code)	Percentage of Portfolio in Western Cape
15	Geo: South Africa Other Percentage	Property database	G1004 (Database code)	Percentage of Portfolio in Other
16	Geo: International Percentage	Property database	G1005 (Database code)	Percentage of Portfolio Internationally
17	Total Sector Concentration	Property database	S2001 (Database code)	Standard Deviation of Percentage allocations in Sector variables
18	Sector: Office Percentage	Property database	S2002 (Database code)	Percentage of Portfolio in Office
19	Sector: Retail Percentage	Property database	S2003 (Database code)	Percentage of Portfolio in Retail
20	Sector: Industrial Percentage	Property database	S2004 (Database code)	Percentage of Portfolio in Industrial
21	Sector: Other Percentage	Property database	S2005 (Database code)	Percentage of Portfolio in Other Sectors
22	Vacancy Percentage of Portfolio	Property database	P3001 (Database code)	Percentage of Portfolio Vacant

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4.8 Data Analysis

The data was processed through the style-engine to produce cumulative returns for 3 portfolios, as well as the market portfolio (equal weighted All-Share Top 160 portfolio). Excel was then used to analyses the results graphically into times series graphs and descriptive statistics were also applied on the lognormal monthly returns. Financial time series data often suffers from kurtosis, clustering of volatilities and non-normal distributions which then requires the use of nonparametric test statistics (Daniel, 1990). The data was found to have non-normal distributions.

According to C. Muller and Ward (2013), “The traditional approach of most researchers who have conducted equivalent studies has been to report average monthly or quarterly portfolio returns, and to use t-tests to test for significant differences in the results. We concur that the construction of portfolios of shares is a necessary approach to reduce the volatility in the data. However, we view the use of average monthly or quarterly returns as methodologically weak compared to cumulative returns, in much the same way as average abnormal returns reveal relatively little compared to cumulative abnormal returns in event studies. Our approach therefore is to plot the cumulative index (value) of each portfolio over the timeframe and to visually compare the results.” (p. 4). Patton and Timmermann (2007), concur that the traditional research approaches to test significance of portfolio returns in these types of studies have used t-tests, but believe this to be methodically poor when multiple portfolios are compared to each other. Also, this assumes the portfolios’ returns have unimodal normal distributions and that the portfolios have unequal variances, assumptions which did not hold for the data in this study (see APPENDIX B: Descriptive Statistics for Style Portfolios).

To test hypothesis one and two, the Friedman test was used instead of t-tests, because the Friedman test can produce dependable results regardless of the distribution (Daniel, 1990). A Wilcoxon Rank Sum paired t-test, although suitable as a non-parametric test, and not requiring the data to be normally distributed, would only allow two portfolios to be compared to each other while the Friedman test allows for multiple portfolios. Since the Friedman test does not require the data to be normally distributed outliers were not removed. The test was performed at a 5% level of significance, consistent with most studies of this nature (Saunders et al., 2012).

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To answer research question one the cumulative returns for each tercile was compared to each other using a graphical time series and the linearity of the order of the terciles was determined, consistent with C. Muller and Ward (2013). The results of the Friedman test from hypothesis one was also used to answer research question one.

To answer research question two the cumulative returns for the best performing style-based portfolio was compared with the market portfolio using a graphical time series, consistent with C. Muller and Ward (2013). The results of the Friedman test from hypothesis two was also used to answer research question one.

To answer research question three, a price relative portfolio was created by dividing the value of tercile one with tercile three, as per $\frac{P_{High\ portfolio,\ Style\ i}}{P_{Low\ portfolio,\ Style\ i}}$ … Equation **1**. The slope of the price relative portfolio reveals the time periods of outperformance of tercile one compared to tercile three. The periods when the slope of the price relative is upwards, tercile one is outperforming. If the slope of the price relative is flat, then no outperformance is occurring and there is no difference between the performances of the terciles during that period (C. Muller & Ward, 2013)

4.9 Assumptions

The research assumed that since the portfolios consisted of a maximum of 10 underlying constituents, the resulting portfolios returns would not be normally distributed.

4.10 Research Limitations

The limitations of this research include:

- Only the listed property companies that met the liquidity screening were included into the portfolio construction process. This meant that other illiquid listed property companies were ignored.

- The liquidity screening used a conveniently chosen deflated adjusted one million rand value, this resulted in using a non-probability sampling method, which could produce reliability issues as it introduced biases into the sample selection (Saunders et al., 2012).

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- Data from 1995 was used and there were only a few property companies that met the requirements in the initial years of the study. This could have created too small a data set to analyse in the earlier years of the study period.

- Property companies are in general more illiquid that larger general equities that have been studied, this may have created an emphasis on thinly traded shares.

- In the earlier years of the study period there was incomplete data for the property specific variables chosen. While other property specific variables were ignored, e.g. percentage of debt fixed, lease expiry profile.

- Accounting standards and reporting standards changed during the period of the study. This impacted the availability and quality of the property specific variables used.

- The omission of transaction costs and taxes means that the results would not been a true reflection of the returns that would have been earned by each portfolio in reality.

- Using closing share prices disregards significant changes that may occur during intraday trading. Similarly, the research did not take account spreads between bid and ask prices. This is considerably more important because of the illiquidity of listed property shares compared with other studies of more liquid general equities.

- The portfolios were constructed using an equal weighting, using a market capitalisation weighting would have produced different results, and possibly different conclusions.

- The measurement instrument analyses monthly returns. A different instrument such as annual returns would have produced different results, and possibly different conclusions.

- There are other types of measures to determine performance e.g. sharpe ratio. The study did not look at performance in terms of risk-adjusted returns.

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5 Results with Discussion per each Style

This chapter reviews the results of the portfolios constructed from the style-engine. The results are presented into 22 sections as per the 22 styles of Table 3 which were analysed. To assist in ensuring the results are presented in a concise and meaningful manner, each of the 22 sections have a single graphical times series of the cumulative returns of the three portfolios (terciles), the market portfolio and the price relative portfolio. The 22 sections are then broken into three subsections related to the three research questions and their linkage with the two hypotheses, as follows:

1. Research question one and hypothesis one – the ranking and performance of the three portfolios is presented with the results of the Friedman test analysing the three portfolios.
2. Research question two and hypothesis two – the spread of the performance of the best performing portfolio and the market portfolio is presented with the results of the Friedman test analysing the best performing portfolio and the market portfolio.
3. Research question three – the price relative portfolios behaviour is presented.

For ease of reference and simplicity, each of the 22 sections has been presented on two pages, with one page presenting the graphical times series and the next page presenting the results for that style. The results for the first style, momentum, have been presented over two pages as initially a more detailed explanation of the graphical times series and tables was provided.

As the results were presented separately by each style and then in relation to the research questions and hypothesis, it was appropriate to make linkages to the literature for that specific style in this chapter. In Chapter 6, the results of all styles are discussed in a collective manner in relation to the research questions and hypotheses with linkages to the literature for the main themes identified.

Summary tables of the results can be found in at the end of the chapter. Detailed descriptive statistics on the lognormal returns of the three portfolios are presented in APPENDIX B: Descriptive Statistics for Style Portfolios. Graphical time series for results with poor data from 1995 to 2000, that were not used, are presented for completeness in APPENDIX C: Graphical Time Series of Style with poor Data.

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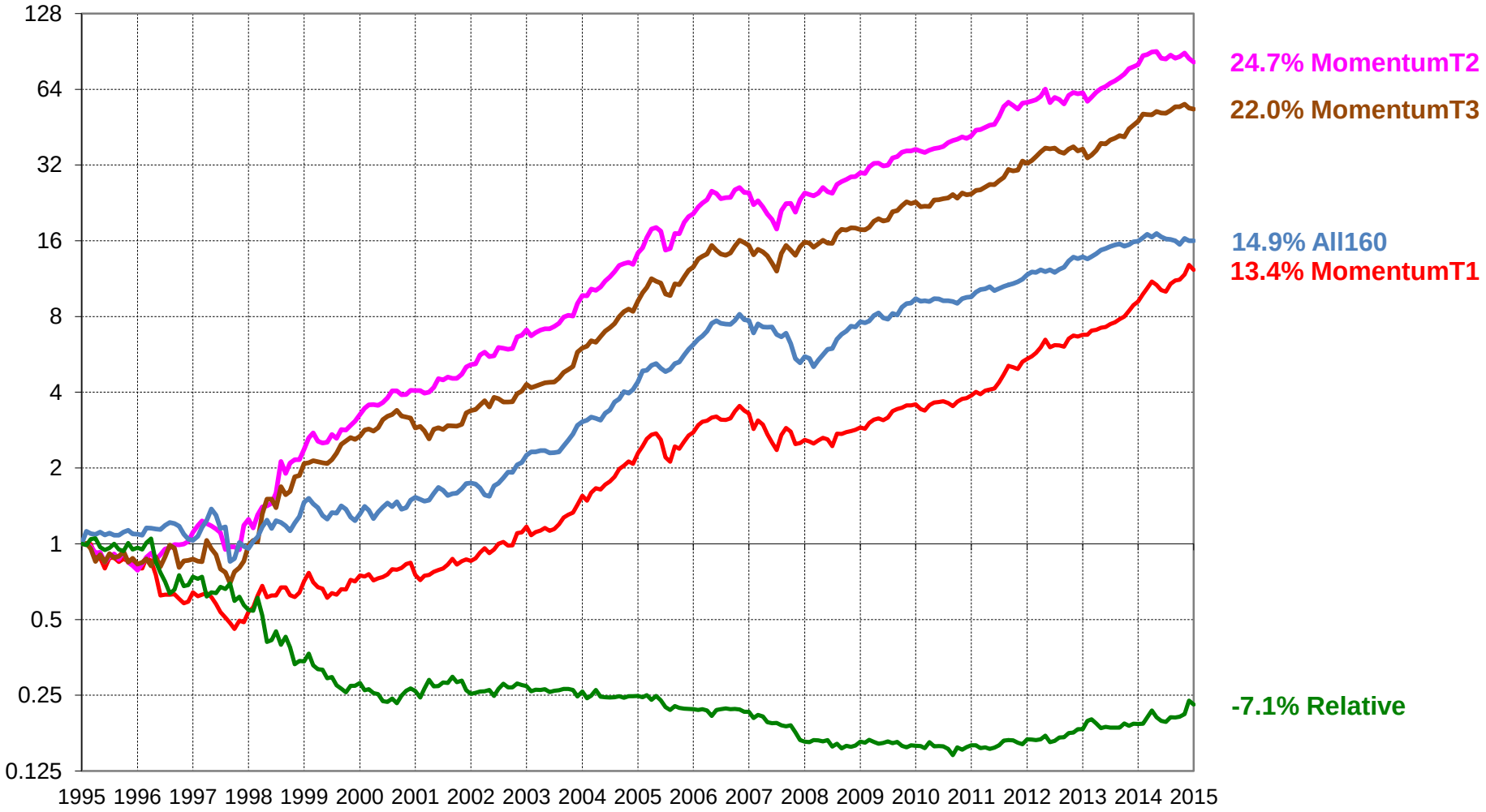
5.1 Momentum

Figure 7: Graphical Time Series of Style: Momentum



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5.1.1 Research Question One and Hypothesis One

In relation to research question one; it can be observed from the graphical time series of the cumulative returns of the three terciles constructed from the momentum style as per Figure 7 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (24.7% compound annual return), tercile three (22.0% p.a.) and tercile one (13.4% p.a.). This is contrary to the findings of C. Muller and Ward (2013), who found momentum to be the best performing strategy with alignment of the order of their portfolios.

Table 6: Portfolio Results: Friedman Test for Momentum

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	3.508333	2	0.173051	No

The 240 lognormal monthly returns for each of the three portfolios from December 1995 to December 2015 were analysed with each other. Since it was assumed that the portfolios were not normally distributed (descriptive statistics can be found in APPENDIX B: Descriptive Statistics for Style Portfolios) the Friedman test was used which ranks each portfolios return with the other portfolios at each point in time to determine a Friedman test statistic which is then converted into a Chi-squared p-value. If the p-value is larger than 5% then the result fails to reject Null hypothesis, which states that the portfolios are the same .i.e. there is no difference between the portfolios. Research question one seeks to determine if the portfolios are significantly different from each other and if there is consistency in their returns (a linear order in the three terciles performance ranking). Graphically from Figure 7 for the momentum style it was observed that no linear performance ranking existed. From Table 6 the Chi-squared p-value of 17.31% is great than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no difference between the portfolios at a 5% level of significance.

5.1.2 Research Question Two and Hypothesis Two

In relation to research question two; the market portfolio's cumulative return was 14.9% p.a. over the period which was below the best performing portfolio (tercile two) which had a cumulative return of 24.7% p.a. The spread between the best performing portfolio and the market portfolio was 9.8%. The market portfolio is constructed from the largest 160 JSE shares by market capitalisation, which includes both general equities and listed property companies. Since C. Muller and Ward (2013) also constructed their portfolios from the same 160 JSE shares this meant that their

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portfolios would average to the return of the market portfolio, with some portfolios outperforming the market portfolio, while others would then need to underperform the market portfolio. Unlike C. Muller and Ward (2013), this study constructed the portfolios from the JSE listed property companies that met the liquidity screening which meant that the average of the portfolios would not be equal to the market portfolio. In fact the average of the portfolios would be higher than the market portfolio as the listed property sector has outperformed general equities over the period of the study (see Figure 1). This study shows that for all styles, except momentum, all terciles outperformed the market portfolio, only tercile one for the momentum style underperformed the market portfolio.

Table 7: Market and Portfolio Results: Friedman Test for Momentum

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	1.350000	1	0.245278	No
Tercile 2 (Best)	2	2.816667	1	0.093290	No
Tercile 3	2	3.266667	1	0.070701	No

Graphically from Figure 7 for the momentum style it was observed that tercile two was the best performing portfolio. From Table 7 the Chi-squared p-value of 9.33% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.1.3 Research Question Three

It was expected that for the momentum style to be meaningful that the terciles would have had a linear order. For this reason when answering research question three the study has analysed the high style-based portfolio (tercile one) compared to the low style-based portfolio (tercile three) using the price relative portfolio (the green line in Figure 7). However, the study did not find the momentum style to have a linear order. The slope of the price relative portfolio shows periods of out-/under-performance. From 1996 to 2001 and from 2005 to 2009, tercile three outperformed tercile one; there was no performance difference from 1995 to 1996, from 2001 to 2005 and from 2009 to 2011; while tercile one outperformed tercile three from 2012 till 2015. The price relative portfolio represents an “investment” in buying tercile one and shorting tercile three, the compound annual return for this “investment” would have been -7.1% (this is not the same as the spread between tercile one and tercile three, which does not cater for compounding, which was -8.7%). Interestingly the spread between the best performing portfolio (tercile two) and worst performing portfolio (tercile one) was 11.3%.

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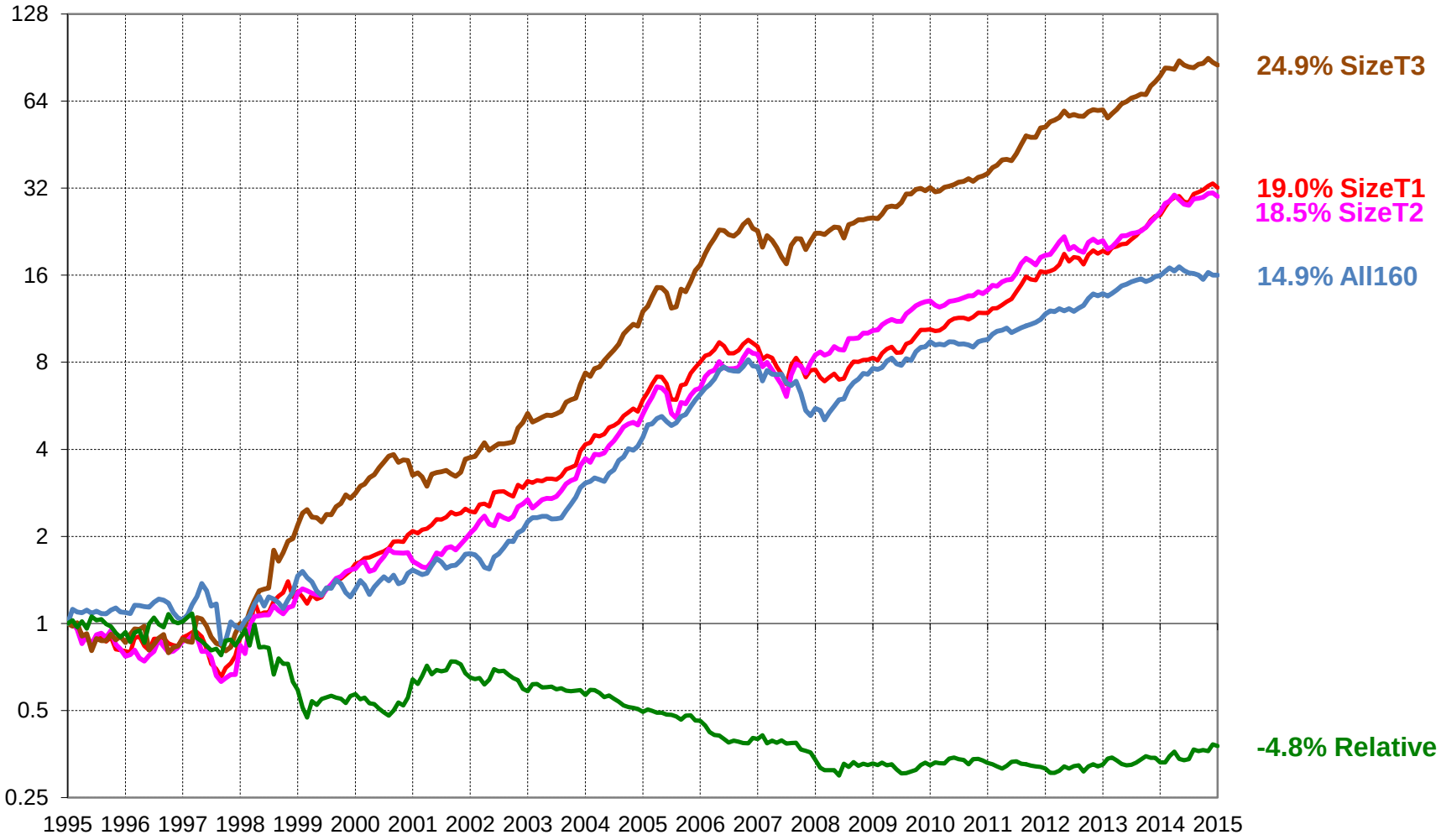
5.2 Size

Figure 8: Graphical Time Series of Style: Size



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5.2.1 Research Question One and Hypothesis One

According to C. Muller and Ward (2013), “Almost all the literature reports a small size effect” (p. 7) yet they did not find evidence of the small size effect. It can be observed for the size style from Figure 8 that it is unclear if a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (24.9% p.a.), tercile one (19.0% p.a.) and tercile two (18.5% p.a.). It should however be noted that tercile one has performed only marginally better than terciles two and had the study ended on 30 June 2015 and not 4 December 2015, there would have been a linear relationship.

Table 8: Portfolio Results: Friedman Test for Size

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	8.908333	2	0.01163	Yes

From Table 8 the Chi-squared p-value of 1.16% is less than 5% so the study rejects the Null hypothesis for hypothesis one i.e. there is a significant difference between the portfolios at a 5% level of significance, hence this study supports the general literature of the small size effect, unlike C. Muller and Ward (2013).

5.2.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 10.0%.

Table 9: Market and Portfolio Results: Friedman Test for Size

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.016667	1	0.897279	No
Tercile 2	2	0.266667	1	0.605577	No
Tercile 3 (Best)	2	3.750000	1	0.052808	No

From Table 9 the Chi-squared p-value of 5.28% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.2.3 Research Question Three

In relation to research question three; using the slope of the price relative portfolio showed that most of tercile three’s outperformance over tercile one was from 2001 to 2008, but from 2008 there has been no evidence of the small size effect.

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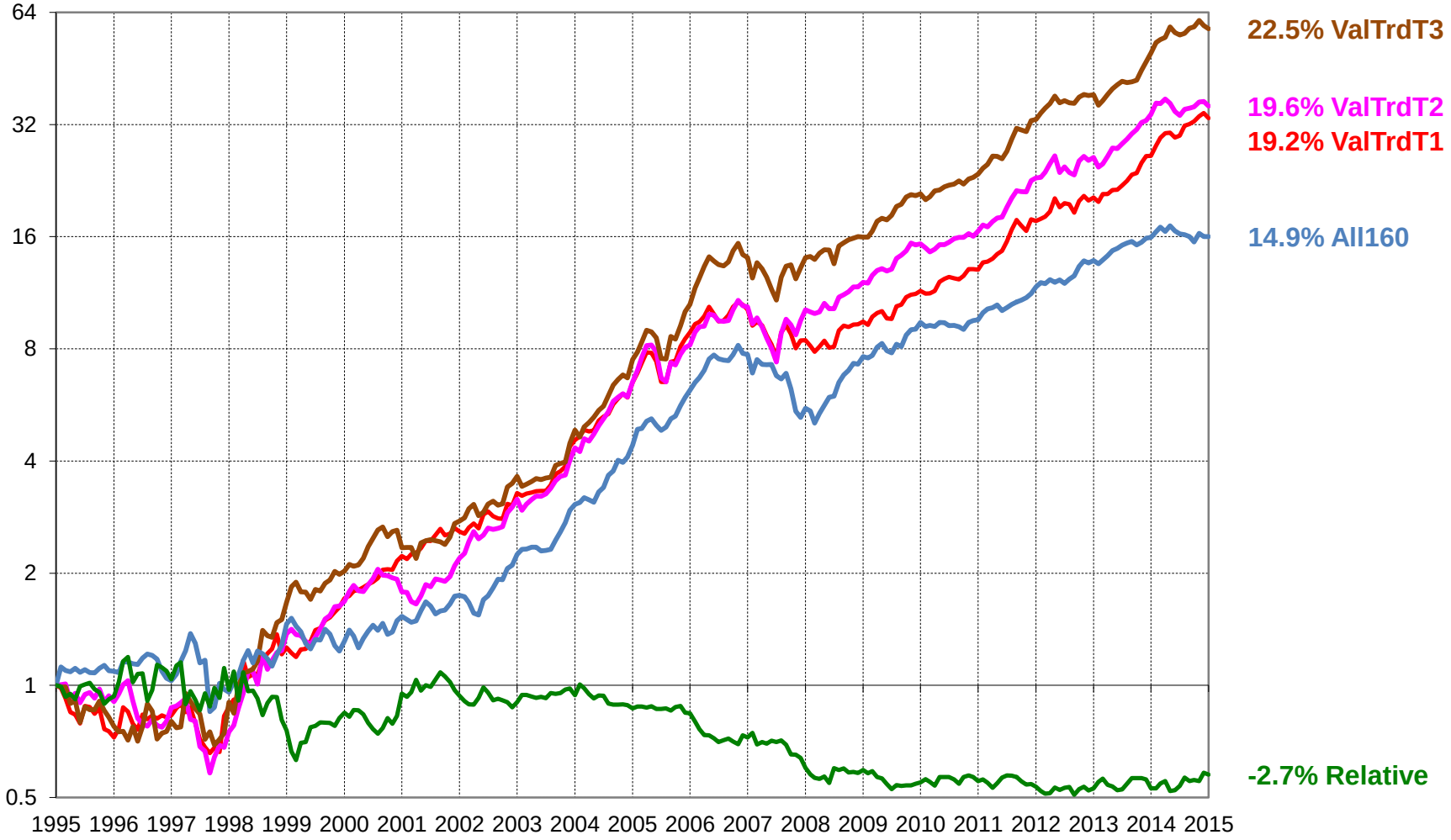
5.3 Value Traded

Figure 9: Graphical Time Series of Style: Value Traded



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5.3.1 Research Question One and Hypothesis One

It can be observed for the value traded style from Figure 9 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (22.5% p.a.), tercile two (19.6% p.a.) and tercile one (19.2% p.a.). The linear relationship and that tercile three was the best performing portfolio, would support C. Muller and Ward (2013) and the general literature of the existence of an illiquidity premium. This study also found that after 2005 this has been the case when analysing value traded as a percentage of market capitalisation (see Figure 10), the liquidity measure used by C. Muller and Ward (2013). However the opposite was found to be the case when analysing value traded as a percentage of market capitalisation over the whole period.

Table 10: Portfolio Results: Friedman Test for Value Traded

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	0.908333	2	0.634977	No

From Table 10 the Chi-squared p-value of 63.50% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.3.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.6%.

Table 11: Market and Portfolio Results: Friedman Test for Value Traded

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.416667	1	0.518605	No
Tercile 2	2	0.600000	1	0.438578	No
Tercile 3 (Best)	2	2.816667	1	0.093290	No

From Table 11 the Chi-squared p-value of 9.33% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.3.3 Research Question Three

In relation to research question three; using the slope of the price relative portfolio showed that most of tercile three's outperformance over tercile one was from 2002 to 2008, but from 2008 there has been no performance difference.

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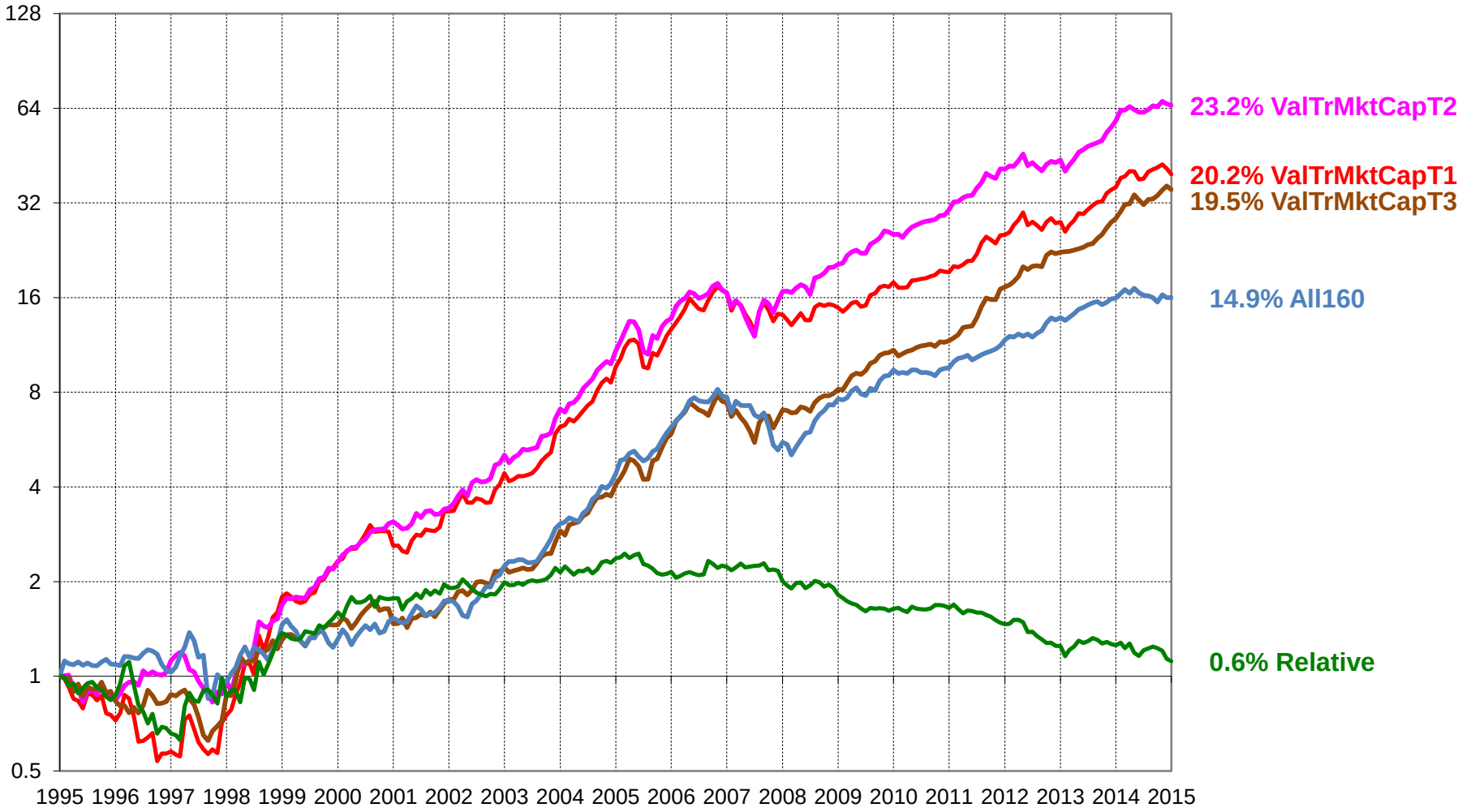
5.4 Value Traded / Market Capitalisation

Figure 10: Graphical Time Series of Style: Value Traded / Market Capitalisation



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5.4.1 Research Question One and Hypothesis One

It can be observed for the value traded as a percentage of market capitalisation style from Figure 10 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (23.2% p.a.), tercile one (20.2% p.a.) and tercile three (19.5% p.a.).

Table 12: Portfolio Results: Friedman Test for Value Traded / Market Capitalisation

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	1.758333	2	0.415129	No

From Table 12 the Chi-squared p-value of 41.51% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.4.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 8.4%.

Table 13: Market and Portfolio Results: Friedman Test for Value Traded / Market Capitalisation

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.266667	1	0.605577	No
Tercile 2 (Best)	2	2.816667	1	0.093290	No
Tercile 3	2	1.350000	1	0.245278	No

From Table 13 the Chi-squared p-value of 9.33% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.4.3 Research Question Three

In relation to research question three; using the slope of the price relative portfolio showed that most of tercile three's outperformance over tercile one was from 1997 to 2005, while tercile one outperformed tercile three from 2005 to 2015. Both trends show long term persistency, which indicates possible seasonality. C. Muller and Ward (2013) supported the general literature of the existence of an illiquidity premium, this study suggests that for the last ten years this has been the case for property.

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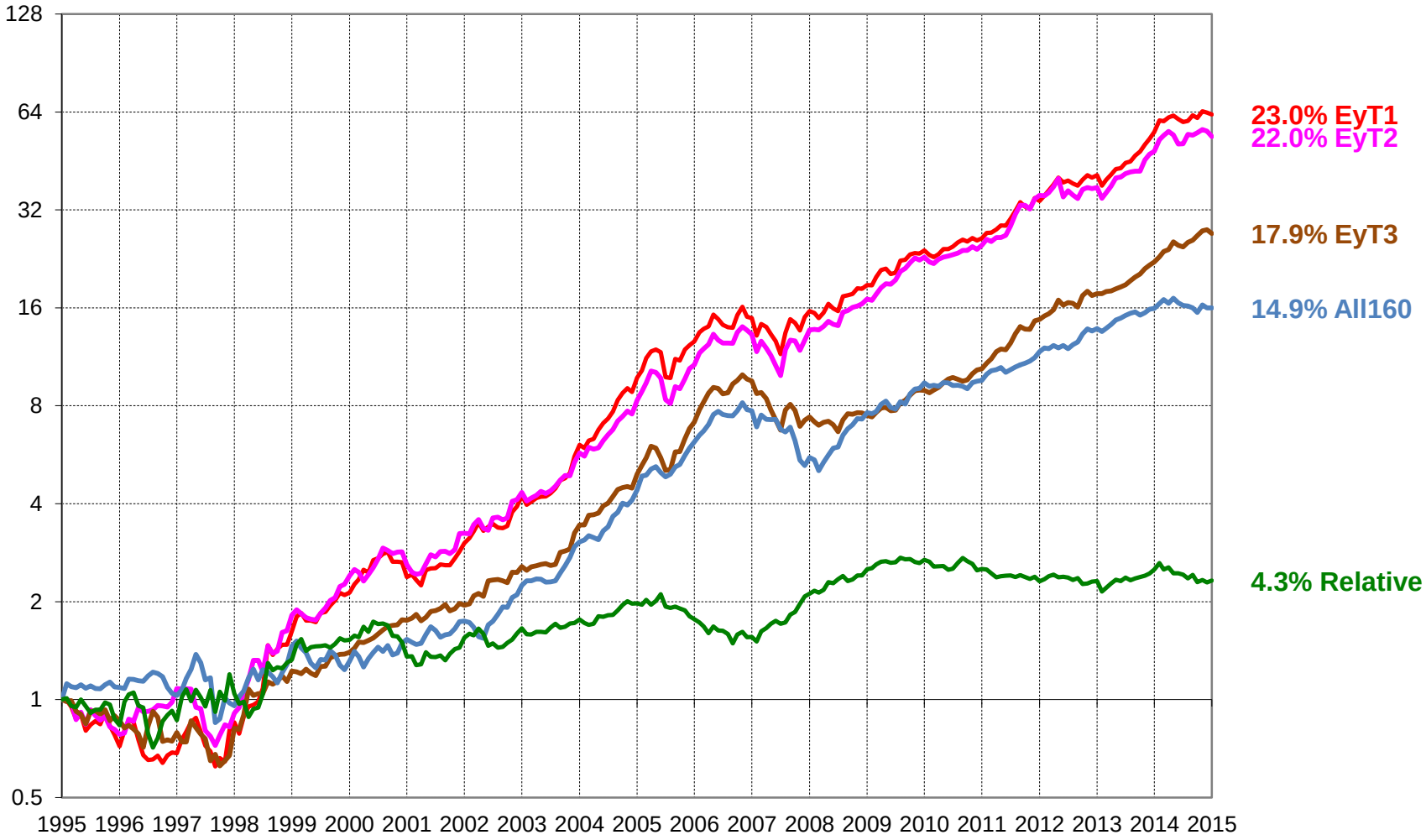
5.5 Earnings Yield

Figure 11: Graphical Time Series of Style: Earnings Yield



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5.5.1 Research Question One and Hypothesis One

It can be observed for the earnings yield style from Figure 11 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile one (23.0% p.a.), tercile two (22.0% p.a.) and tercile three (17.9% p.a.). It should however be noted that tercile one and tercile two have performed almost identically over the period, suggesting that differences may only exist when considering low earnings yields. The results support the findings of C. Muller and Ward (2013) and the general literature of the existence of earnings yield style.

Table 14: Portfolio Results: Friedman Test for Earnings Yield

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	6.175	2	0.045616	Yes

From Table 14 the Chi-squared p-value of 4.56% is less than 5% so the study rejects the Null hypothesis for hypothesis one i.e. there is a significant difference between the portfolios at a 5% level of significance.

5.5.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile one) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 8.1%.

Table 15: Market and Portfolio Results: Friedman Test for Earnings Yield

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1 (Best)	2	0.816667	1	0.366157	No
Tercile 2	2	1.666667	1	0.196706	No
Tercile 3	2	0.266667	1	0.605577	No

From Table 15 the Chi-squared p-value of 36.62% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile one and the market portfolio at a 5% level of significance.

5.5.3 Research Question Three

The slope of the price relative portfolio showed tercile one outperformed tercile three for most of the study until 2010 (excluding from 2005 to 2006), but from 2010 there has been no performance difference.

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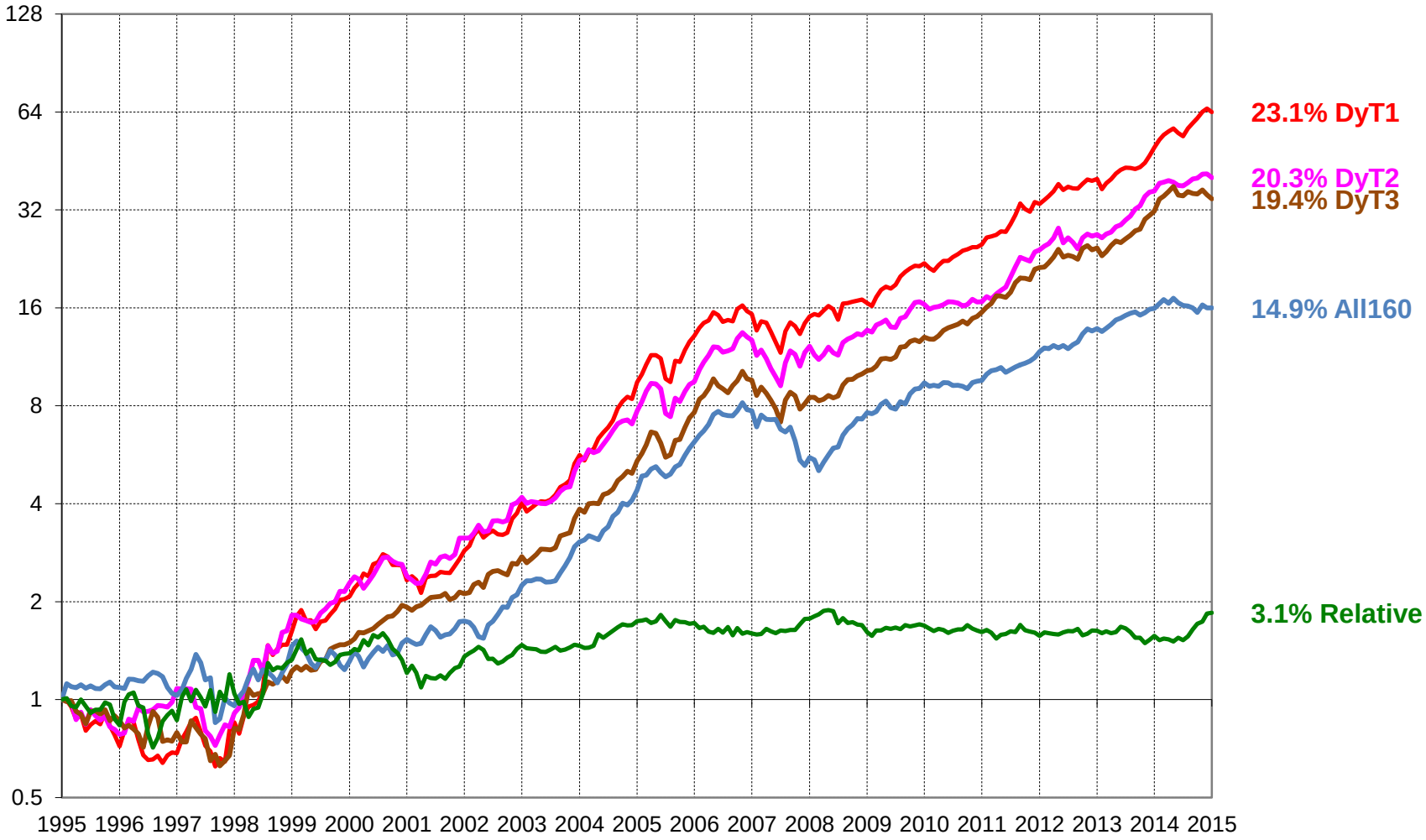
5.6 Dividend Yield

Figure 12: Graphical Time Series of Style: Dividend Yield



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5.6.1 Research Question One and Hypothesis One

It can be observed for the dividend yield style from Figure 12 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile one (23.1% p.a.), tercile two (20.3% p.a.) and tercile three (19.4% p.a.). These results are similar to the earnings yield style, since good earnings support the paying of dividends. The study supports the findings of C. Muller and Ward (2013) and the general literature of the existence of a dividend yield style.

Table 16: Portfolio Results: Friedman Test for Dividend Yield

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	0.658333	2	0.719523	No

From Table 16 the Chi-squared p-value of 71.96% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.6.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile one) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 8.2%.

Table 17: Market and Portfolio Results: Friedman Test for Dividend Yield

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1 (Best)	2	0.600000	1	0.438578	No
Tercile 2	2	0.150000	1	0.698535	No
Tercile 3	2	0.266667	1	0.605577	No

From Table 17 the Chi-squared p-value of 43.86% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile one and the market portfolio at a 5% level of significance.

5.6.3 Research Question Three

The slope of the price relative portfolio showed tercile one outperformed tercile three at the beginning of the study from 1997 to 2005, but from 2005 there has been no performance difference. Dividend yield is followed more closely by property analysts than earnings yield (SA REIT Association, n.d.), this may offer insight to why the divided yield style is no longer persistent. Barberis and Shleifer (2003) advise that a style may disappear as they are discovered and become prominent.

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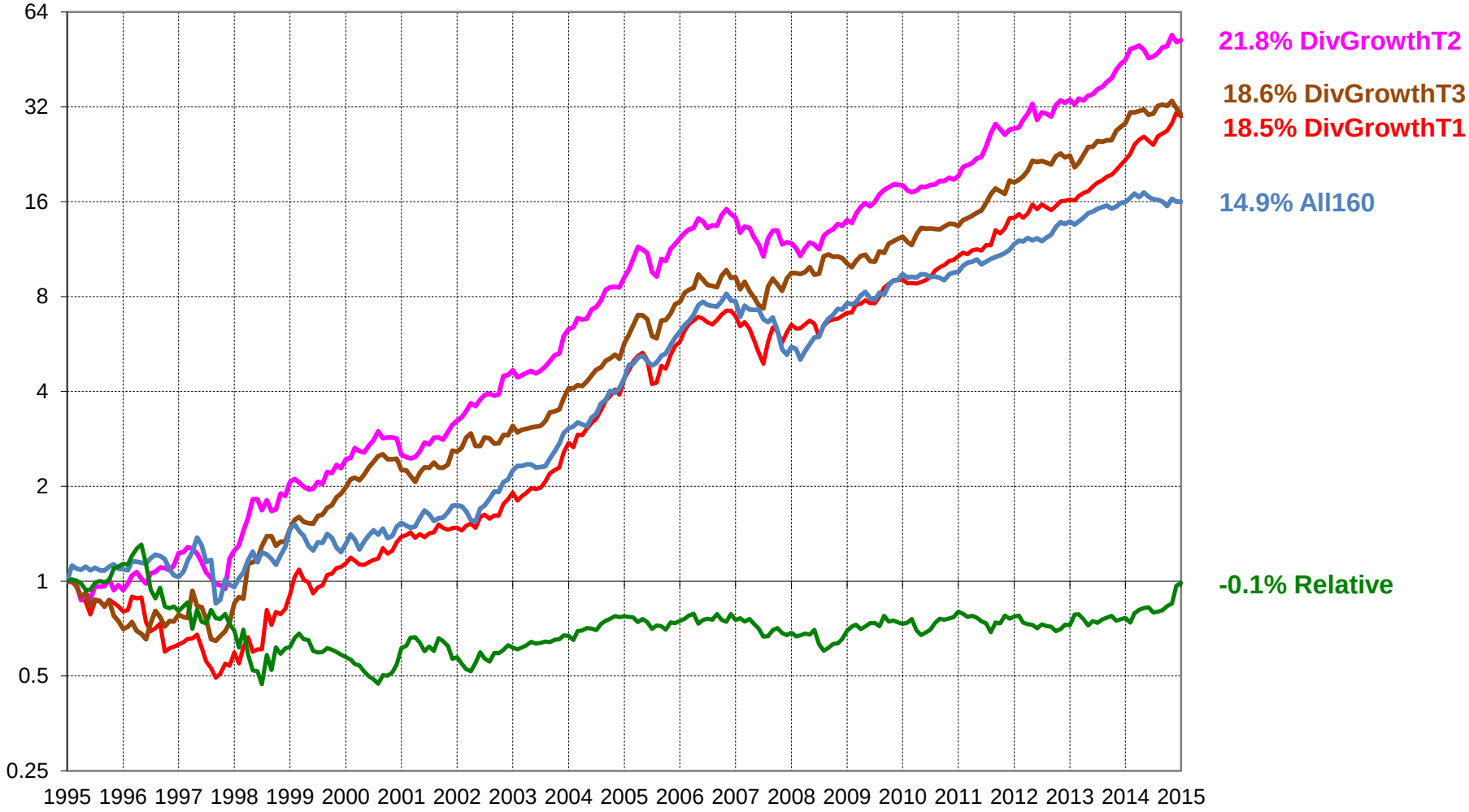
5.7 Dividend Growth

Figure 13: Graphical Time Series of Style: Dividend Growth



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5.7.1 Research Question One and Hypothesis One

It can be observed for the dividend growth style from Figure 13 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (21.8% p.a.), tercile three (18.6% p.a.) and tercile one (18.5% p.a.).

Table 18: Portfolio Results: Friedman Test for Dividend Growth

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	1.575	2	0.454981	No

From Table 18 the Chi-squared p-value of 45.50% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.7.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.0%. Conventional wisdom would recommend investing in companies with the highest growth in dividends, yet the results show that it is rather companies that are growing conservatively (medium dividend growth) that produce the most profitable style.

Table 19: Market and Portfolio Results: Friedman Test for Dividend Growth

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.150000	1	0.698535	No
Tercile 2 (Best)	2	2.400000	1	0.121335	No
Tercile 3	2	0.016667	1	0.897279	No

From Table 19 the Chi-squared p-value of 12.13% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.7.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one at the beginning of the study from 1996 to 2001, but from 2005 to 2014 there has been no performance difference. Similar to dividend yield, the growth in dividend is followed closely by property analysts (SA REIT Association, n.d.). The long period of no persistent performance difference also supports Barberis and Shleifer (2003) findings that a style may disappear as they are discovered and become prominent.

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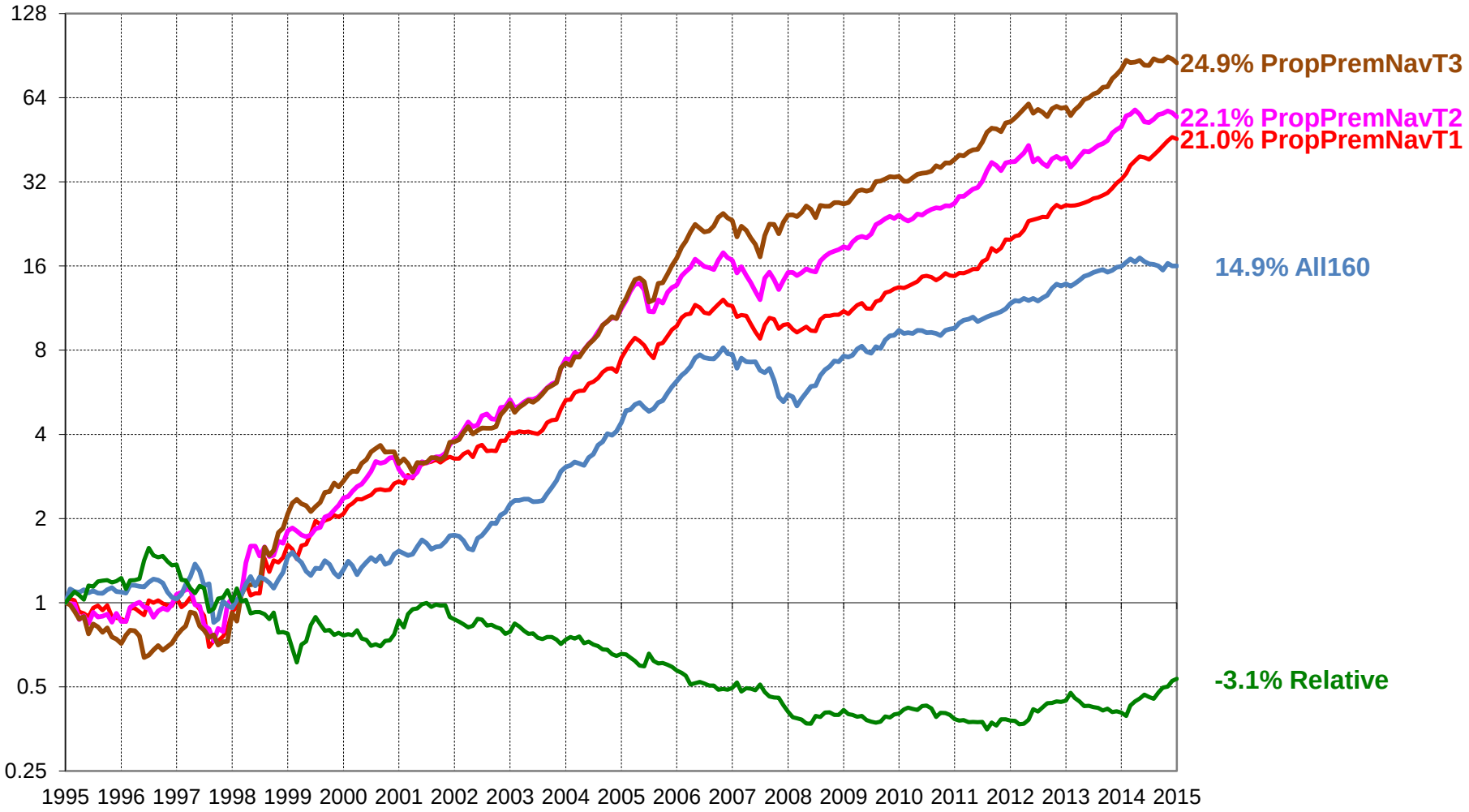
5.8 Price to NAV

Figure 14: Graphical Time Series of Style: Price to NAV



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5.8.1 Research Question One and Hypothesis One

It can be observed for the price to NAV style from Figure 14 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (24.9% p.a.), tercile two (22.1% p.a.) and tercile one (21.0% p.a.). The linear relationship and that tercile three was the best performing portfolio (companies that trade at large discounts to their NAV), supports C. Muller and Ward's (2013) findings on the price to book ratio which supports the general literature and the concept of "value investing" popularised by Graham and Dodd (1934).

Table 20: Portfolio Results: Friedman Test for Price to NAV

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	4.808333	2	0.090341	No

From Table 20 the Chi-squared p-value of 9.03% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.8.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 10.0%.

Table 21: Market and Portfolio Results: Friedman Test for Price to NAV

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.066667	1	0.796253	No
Tercile 2	2	1.350000	1	0.245278	No
Tercile 3 (Best)	2	2.016667	1	0.155580	No

From Table 21 the Chi-squared p-value of 15.56% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.8.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one mainly from 1997 to 2008, but from 2008 there has been no performance difference. This is similar to C. Muller and Ward (2013) who found that price to book style initial performed well but since 2004 there was little evidence that the style continued to add value.

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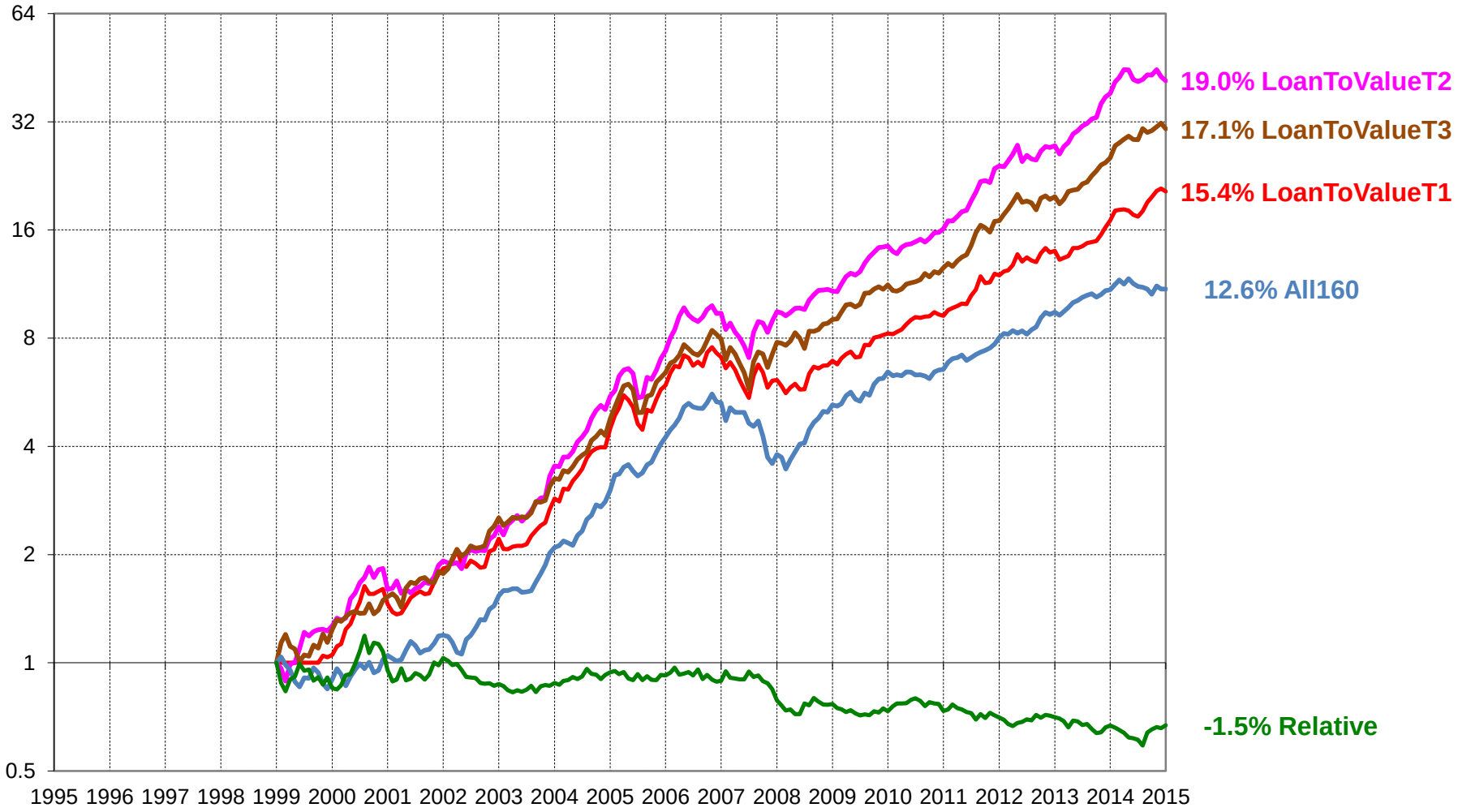
5.9 Loan to Value

Figure 15: Graphical Time Series of Style: Loan to Value



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5.9.1 Research Question One and Hypothesis One

The loan to value style was not relevant between 1995 and 2000, as many listed property companies only started to use leverage in the early 2000s, as such the portfolios were constructed from the 31 December 1999 (see Figure 51 for a graphical time series of the portfolios constructed from the 1995). It can be observed for the loan to value style from Figure 15 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (19.0% p.a.), tercile three (17.1% p.a.) and tercile one (15.4% p.a.). According to C. Muller and Ward (2013), "The theory on capital structure suggests that there is an optimal gearing level for companies" (p. 11) and they found that over-gearing creates financial stress, this study supports this with tercile two having the best performance.

Table 22: Portfolio Results: Friedman Test for Loan to Value

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
192	3	3.5	2	0.173774	No

From Table 22 the Chi-squared p-value of 17.38% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.9.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 6.4%.

Table 23: Market and Portfolio Results: Friedman Test for Loan to Value

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.750000	1	0.386476	No
Tercile 2 (Best)	2	2.083333	1	0.148915	No
Tercile 3	2	0.333333	1	0.563703	No

From Table 23 the Chi-squared p-value of 14.89% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.9.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one from 2001 to 2003 and from 2007 to 2015.

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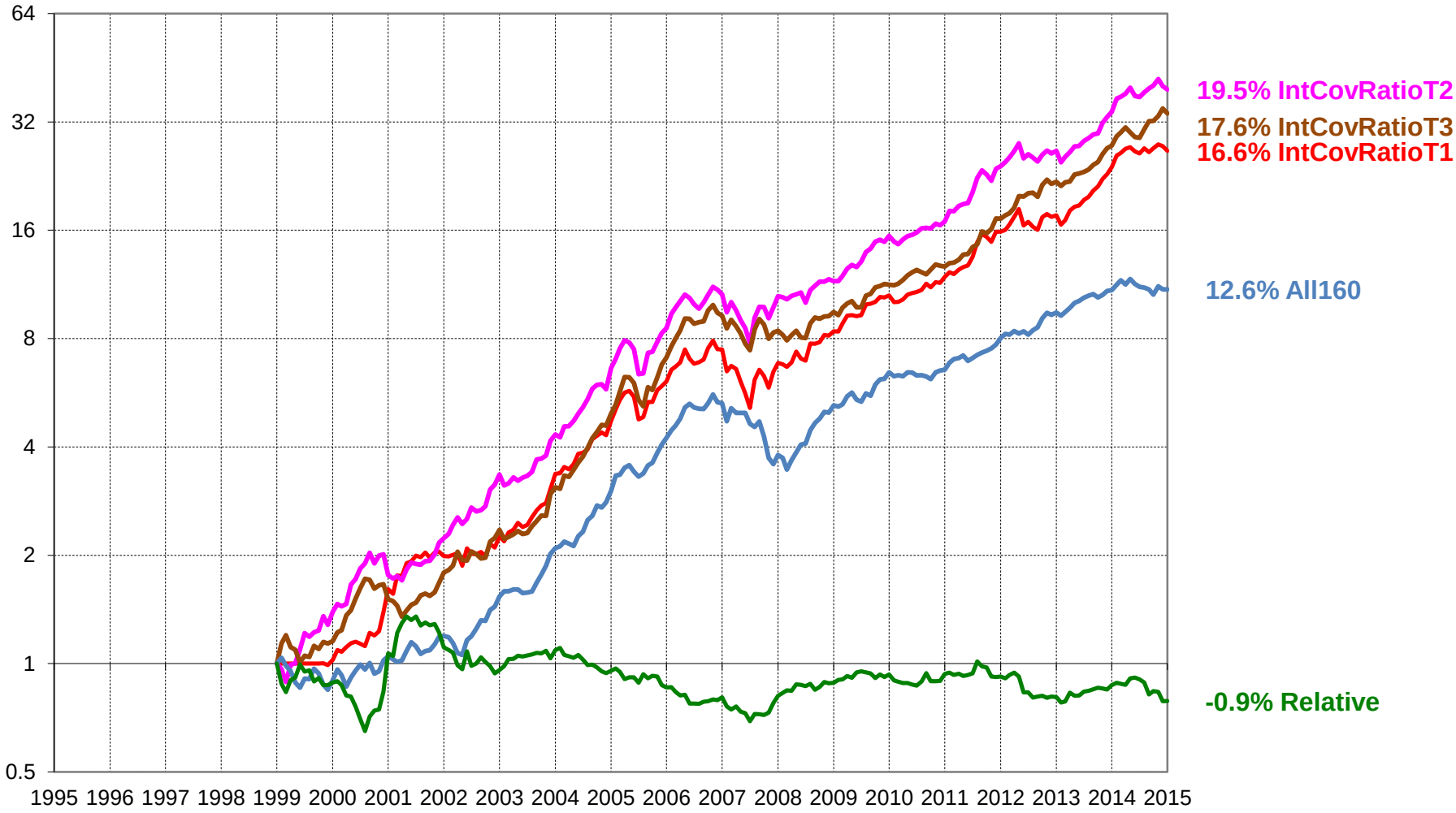
5.10 Interest Cover Ratio

Figure 16: Graphical Time Series of Style: Interest Cover Ratio



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5.10.1 Research Question One and Hypothesis One

For the same reason as the loan to value style, the interest cover ratio style was not relevant between 1995 and 2000; as such the portfolios were constructed from the 31 December 1999 (see Figure 52 for a graphical time series of the portfolios constructed from the 1995). It can be observed for the loan to value style from Figure 16 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (19.5% p.a.), tercile three (17.6% p.a.) and tercile one (16.6% p.a.). This is similar to the findings of the loan to value style, and support C. Muller and Ward (2013) and the general literature of an optimal interest cover ratio.

Table 24: Portfolio Results: Friedman Test for Interest Cover Ratio

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
192	3	0.822917	2	0.662683	No

From Table 24 the Chi-squared p-value of 66.27% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.10.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 6.8%.

Table 25: Market and Portfolio Results: Friedman Test for Interest Cover Ratio

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	1.020833	1	0.312321	No
Tercile 2 (Best)	2	2.520833	1	0.112351	No
Tercile 3	2	2.083333	1	0.148915	No

From Table 25 the Chi-squared p-value of 11.24% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.10.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one from 2001 to 2008 and from 2012 to 2013. Most South African property companies are conservatively geared with loan to value ratios below 50% (SA REIT Association, n.d.). This may suggest that even property companies with the lowest interest cover ratio are not overly-geared and although an optimal level is ideal, it is worse to be under-geared (tercile one) than to be over-geared (tercile three) in the property sector.

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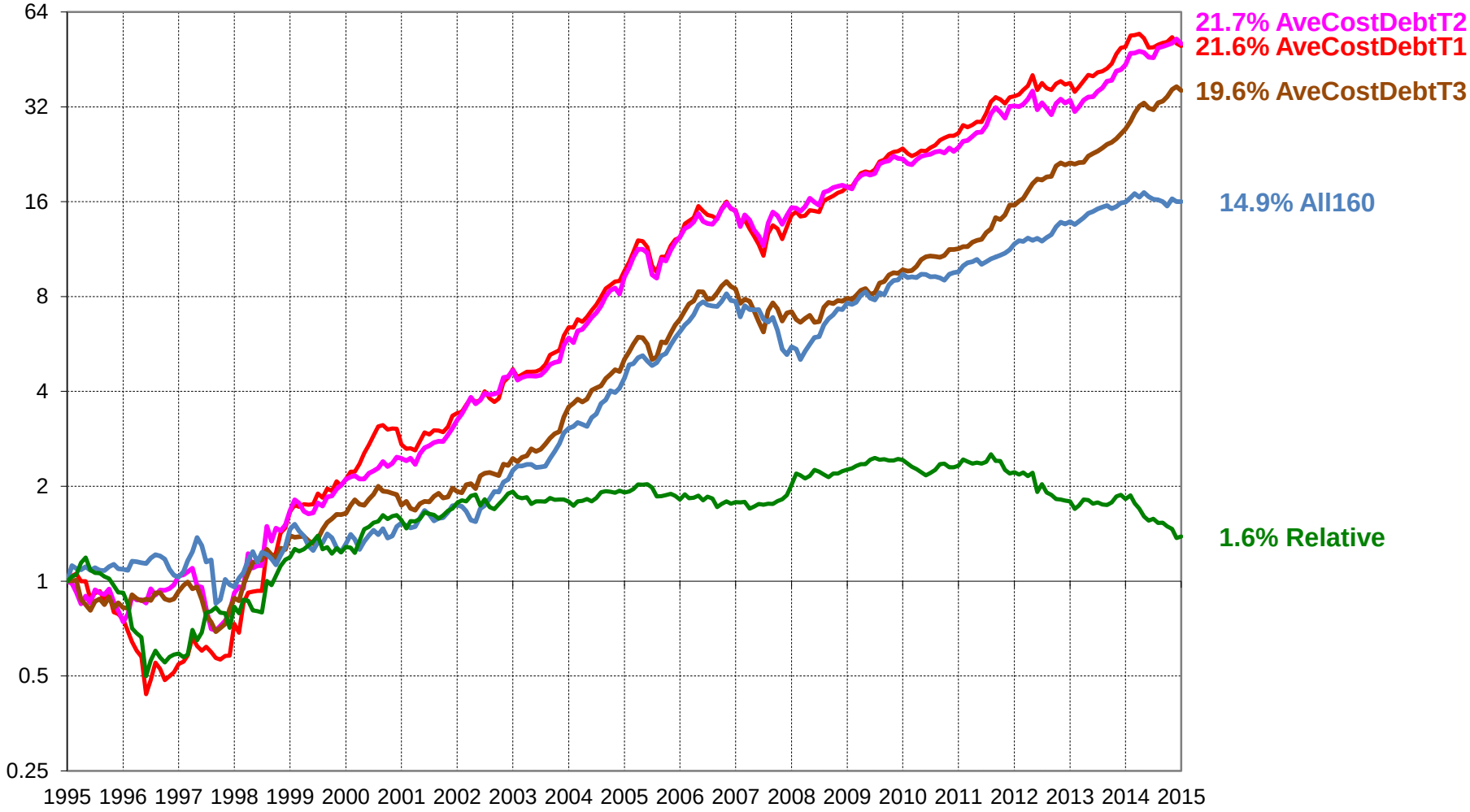
5.11 Average Cost of Debt

Figure 17: Graphical Time Series of Style: Average Cost of Debt



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5.11.1 Research Question One and Hypothesis One

It can be observed for the average cost of debt style from Figure 17 that it is unclear if a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (21.7% p.a.), tercile one (21.6% p.a.) and tercile three (19.6% p.a.). It should however be noted that tercile one and tercile two have performed in a similar manner. Conventional wisdom would recommend investing in companies with the lowest average cost of debt, as this may imply either better management through more efficient funding sources or better quality property assets as lower interest margins are required by banks because they feel the properties are less risky. The results however show that it is rather companies that have the lowest average cost of debt that produce the least profitable portfolio (tercile three).

Table 26: Portfolio Results: Friedman Test for Average Cost of Debt

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	0.933333	2	0.627089	No

From Table 26 the Chi-squared p-value of 62.71% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.11.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 6.8%.

Table 27: Market and Portfolio Results: Friedman Test for Average Cost of Debt

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.416667	1	0.518605	No
Tercile 2 (Best)	2	0.816667	1	0.366157	No
Tercile 3	2	0.266667	1	0.605577	No

From Table 27 the Chi-squared p-value of 36.62% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.11.3 Research Question Three

The slope of the price relative portfolio showed tercile one outperformed tercile three from 1996 to 2002 and from 2007 to 2010, but from 2010 the trend has reversed.

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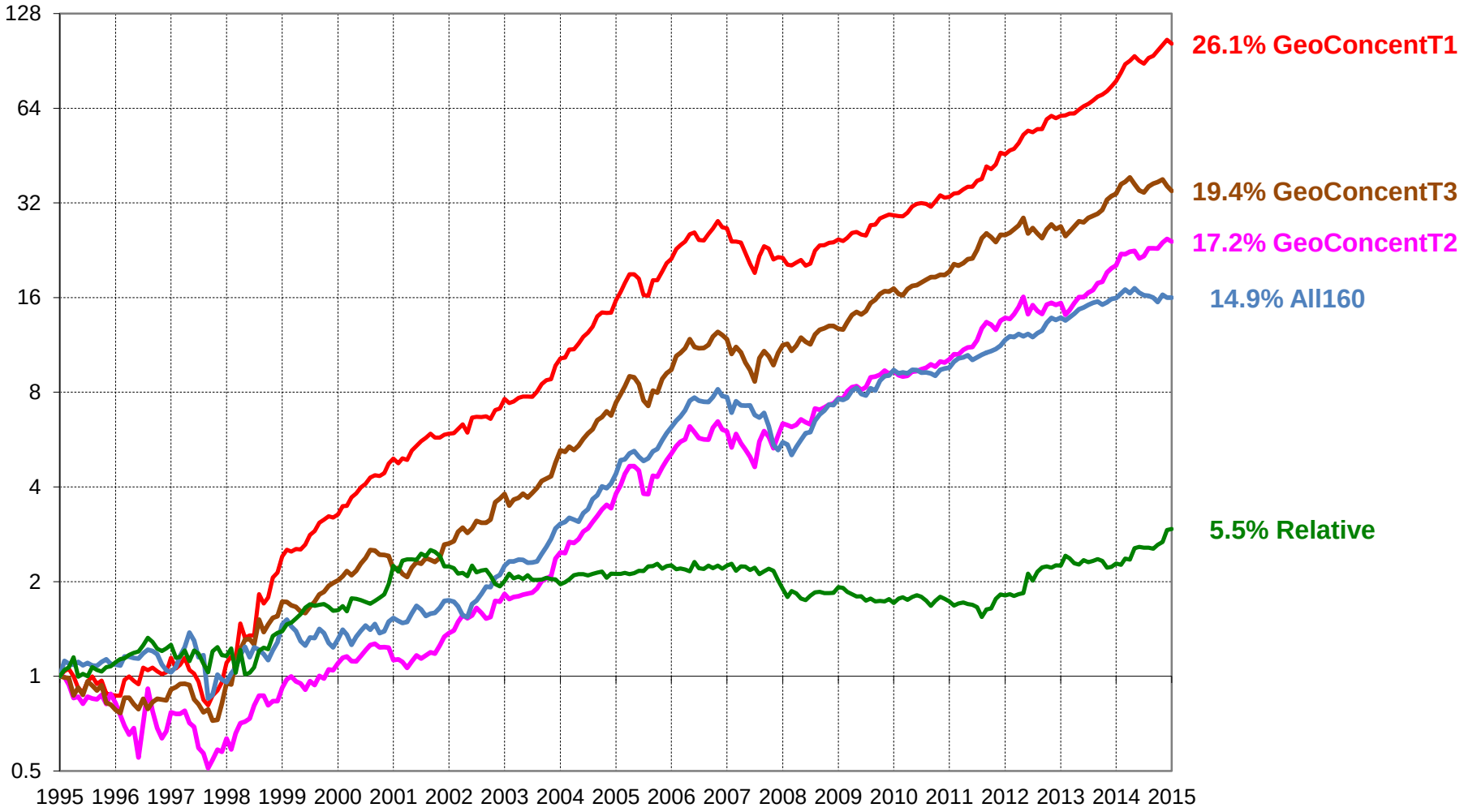
5.12 Total Geographic Concentration

Figure 18: Graphical Time Series of Style: Total Geographic Concentration



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5.12.1 Research Question One and Hypothesis One

It can be observed for the total geographic concentration style from Figure 18 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile one (26.1% p.a.), tercile three (19.4% p.a.) and tercile two (17.2% p.a.).

Table 28: Portfolio Results: Friedman Test for Total Geographic Concentration

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	3.858333	2	0.145269	No

From Table 28 the Chi-squared p-value of 14.53% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.12.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile one) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 11.2%.

Table 29: Market and Portfolio Results: Friedman Test for Total Geographic Concentration

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1 (Best)	2	2.016667	1	0.155580	No
Tercile 2	2	0.150000	1	0.698535	No
Tercile 3	2	0.816667	1	0.366157	No

From Table 29 the Chi-squared p-value of 15.56% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile one and the market portfolio at a 5% level of significance.

5.12.3 Research Question Three

The slope of the price relative portfolio showed tercile one outperformed tercile three from 1998 to 2002 and from 2011. Haß et al. (2012) found that listed real estate investments achieve diversification benefits for investors, this study suggests that although there are benefits of diversification in investing in listed property companies, those companies do not benefit from diversity of underlying properties by geographic location. According to Buchner (2008) a benefit of investing in listed property companies is cost reductions of property management through economies of scale, by not diversifying geographically companies maybe benefiting from economies of scale.

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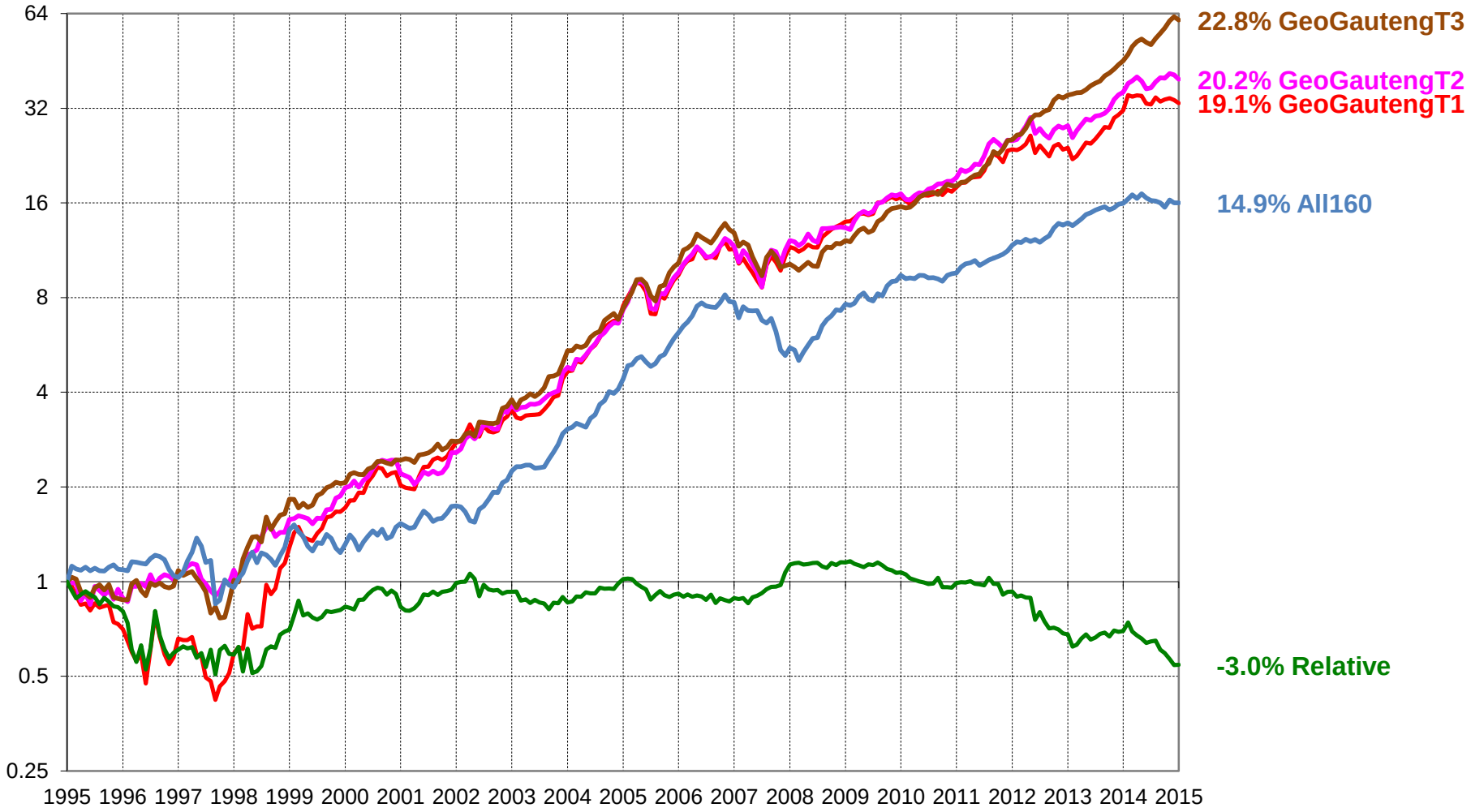
5.13 Geographic: Gauteng Percentage

Figure 19: Graphical Time Series of Style: Geographic Gauteng Percentage



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5.13.1 Research Question One and Hypothesis One

It can be observed for the geographic Gauteng percentage style from Figure 19 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (22.8% p.a.), tercile two (20.2% p.a.) and tercile one (19.1% p.a.). It should however be noted that all three terciles have performed in a similar manner, suggesting that although the style has a linear performance ranking there maybe little difference when considering underlying exposure to the Gauteng. The total geographic concentration style is a function of all of the geographic styles. The study suggests the benefits of a geographically concentrated portfolio of properties but there does not seem to be an advantage in how that portfolio is assembled with respect to Gauteng exposure.

Table 30: Portfolio Results: Friedman Test for Geographic Gauteng Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	0.833333	2	0.659241	No

From Table 30 the Chi-squared p-value of 65.92% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.13.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.9%.

Table 31: Market and Portfolio Results: Friedman Test for Geographic Gauteng Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.600000	1	0.438578	No
Tercile 2	2	1.350000	1	0.245278	No
Tercile 3 (Best)	2	1.666667	1	0.196706	No

From Table 31 the Chi-squared p-value of 19.67% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.13.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one from 1995 to 1998 and from 2012 to 2015.

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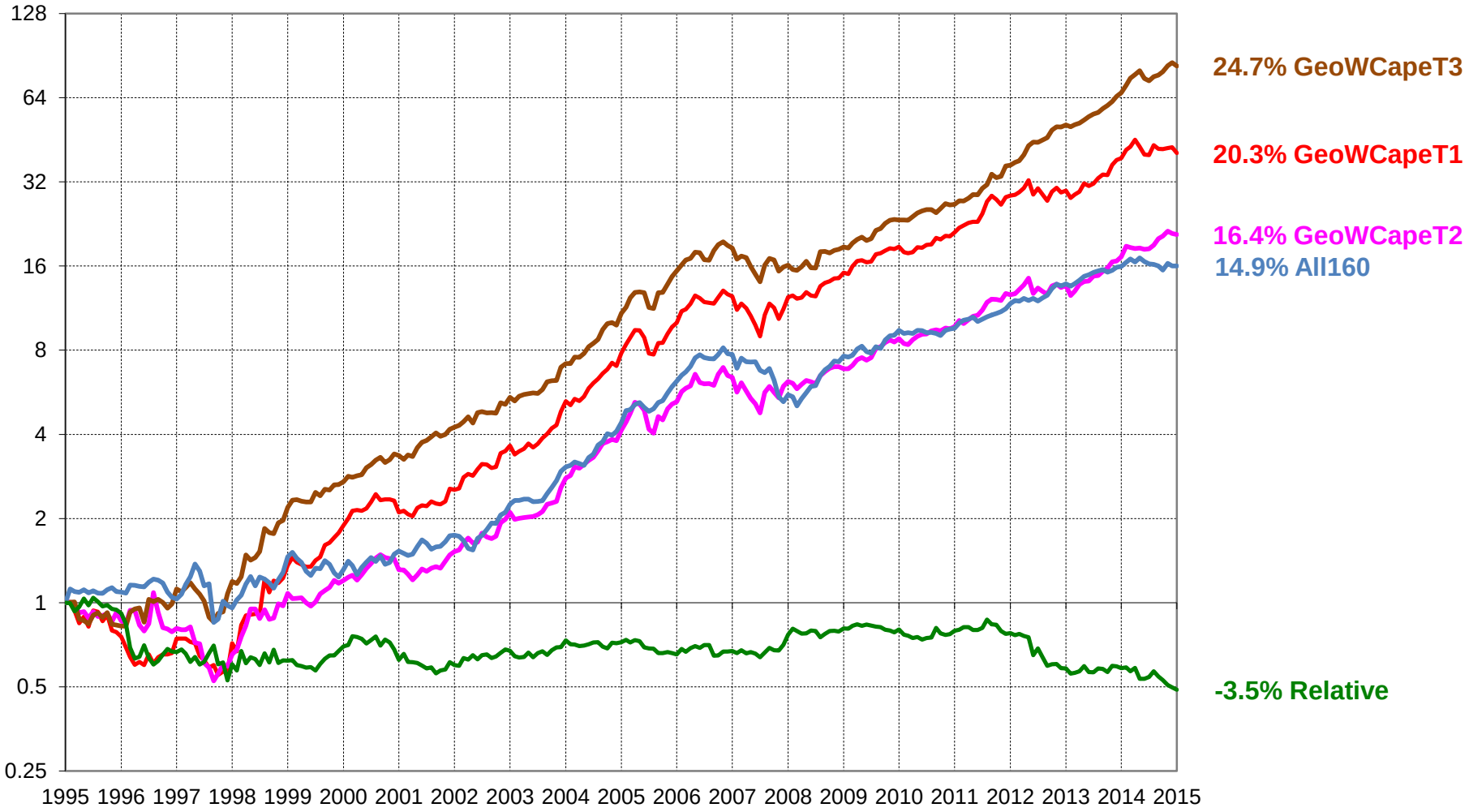
5.14 Geographic: Western Cape Percentage

Figure 20: Graphical Time Series of Style: Geographic Western Cape Percentage



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5.14.1 Research Question One and Hypothesis One

It can be observed for the geographic Western Cape percentage style from Figure 20 that it is no linear performance ranking exists. The terciles are ranked in descending performance are as follows: tercile three (24.7% p.a.), tercile one (20.3% p.a.) and tercile two (16.4% p.a.).

Table 32: Portfolio Results: Friedman Test for Geographic Western Cape Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	2.433333	2	0.296216	No

From Table 32 the Chi-squared p-value of 29.62% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.14.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 9.9%.

Table 33: Market and Portfolio Results: Friedman Test for Geographic Western Cape Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.150000	1	0.698535	No
Tercile 2	2	0.266667	1	0.605577	No
Tercile 3 (Best)	2	2.016667	1	0.155580	No

From Table 33 the Chi-squared p-value of 15.56% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.14.3 Research Question Three

The slope of the price relative portfolio showed tercile three outperformed tercile one from 1995 to 1998 and from 2012 to 2015. From 2000 to 2012 there was no performance difference. The behaviour of the price relative portfolio was similar to that of the geographic Gauteng percentage style; this suggests that there may also be no advantage in how that portfolio is assembled with respect to Western Cape Gauteng exposure.

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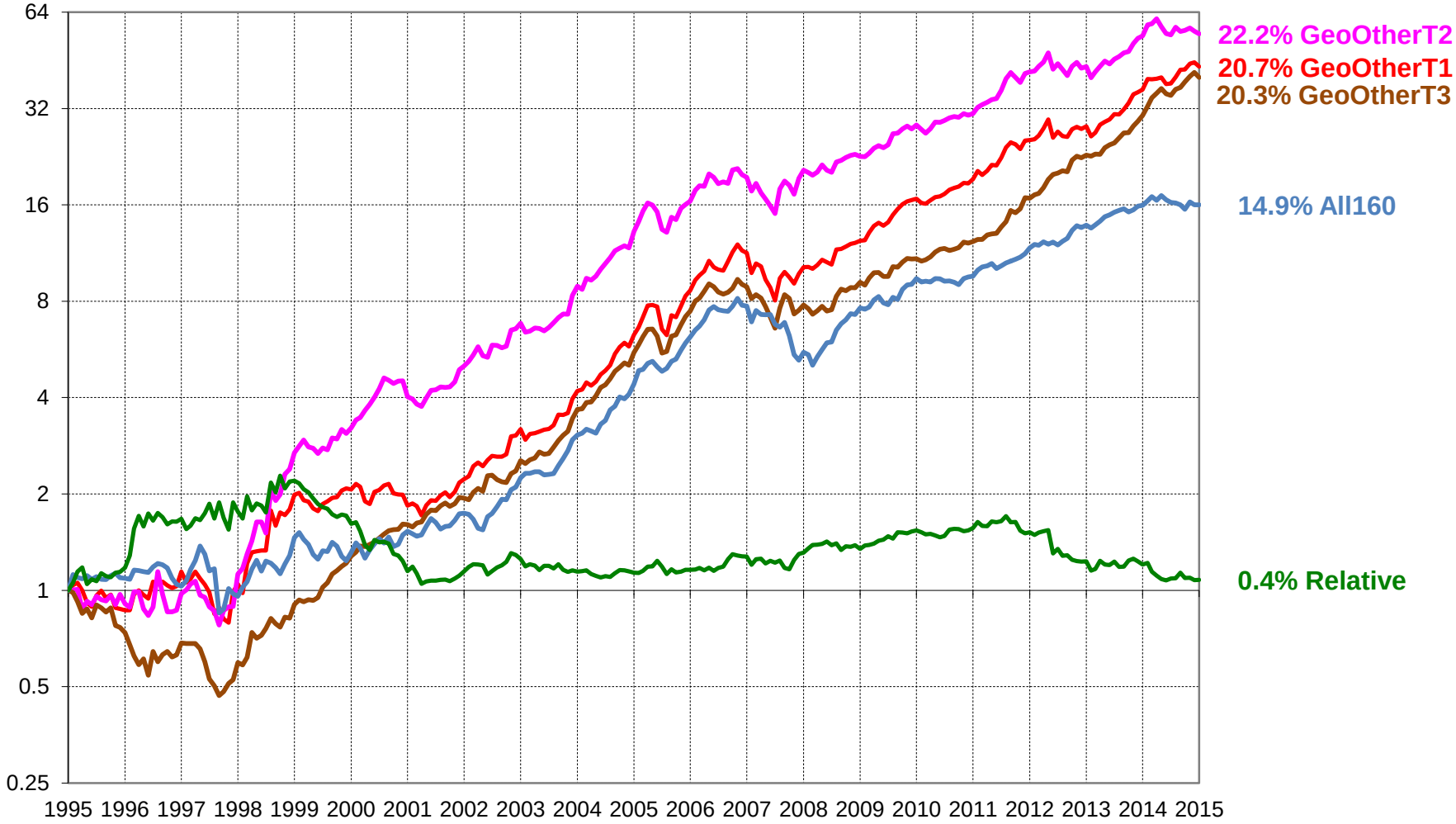
5.15 Geographic: South Africa Other Percentage

Figure 21: Graphical Time Series of Style: Geographic South Africa Other Percentage



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5.15.1 Research Question One and Hypothesis One

It can be observed for the geographic South Africa other percentage style from Figure 21 that no linear performance ranking exists. The terciles are ranked in descending performance are as follows: tercile two (22.2% p.a.), tercile one (20.7% p.a.) and tercile three (20.3% p.a.).

Table 34: Portfolio Results: Friedman Test for Geographic South Africa Other Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	0.975	2	0.61416	No

From Table 34 the Chi-squared p-value of 61.42% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.15.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.3%.

Table 35: Market and Portfolio Results: Friedman Test for Geographic South Africa Other Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.266667	1	0.605577	No
Tercile 2 (Best)	2	1.350000	1	0.245278	No
Tercile 3	2	0.600000	1	0.438578	No

From Table 35 the Chi-squared p-value of 24.53% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.15.3 Research Question Three

The slope of the price relative portfolio showed that most of tercile one's outperformance over tercile three was from 1995 to 1999 and from 2008 to 2012, but from 2012 tercile three has outperformed tercile one. The price relative portfolio indicates the possibility of seasonality, with investors seeking opportunities outside the main geographic locations and then refocusing back to the main geographic locations.

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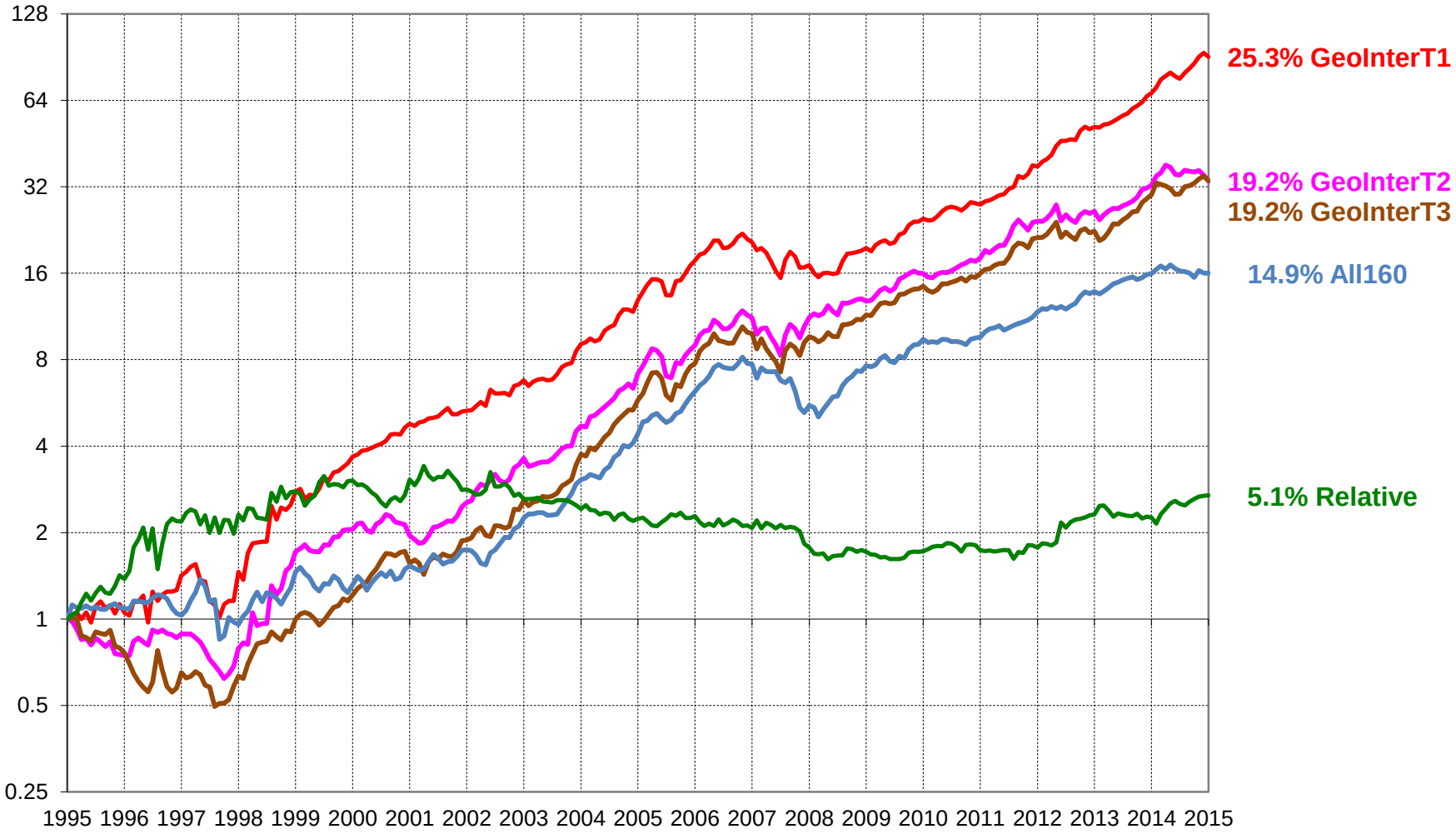
5.16 Geographic: International Percentage

Figure 22: Graphical Time Series of Style: Geographic International Percentage



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5.16.1 Research Question One and Hypothesis One

It can be observed for the geographic international percentage style from Figure 22 that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile one (25.3% p.a.), tercile two (19.2% p.a.) and tercile three (19.2% p.a.). It should however be noted that tercile two and tercile three have performed in a similar manner, suggesting that differences may only exist when considering companies with high exposure to international properties (tercile one).

Table 36: Portfolio Results: Friedman Test for Geographic International Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	1.508333	2	0.470402	No

From Table 36 the Chi-squared p-value of 47.04% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.16.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile one) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 10.4%.

Table 37: Market and Portfolio Results: Friedman Test for Geographic International Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1 (Best)	2	0.816667	1	0.366157	No
Tercile 2	2	0.416667	1	0.518605	No
Tercile 3	2	0.416667	1	0.518605	No

From Table 37 the Chi-squared p-value of 36.62% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile one and the market portfolio at a 5% level of significance.

5.16.3 Research Question Three

The slope of the price relative portfolio showed that most of tercile one's outperformance over tercile three was from 1995 to 2001 and from 2008 to 2015. Persistence over the last seven years suggests investing in companies with high international exposure. This is supported by the current market trend were companies are increasing their international exposure (Anderson, 2015; J. Muller, 2015).

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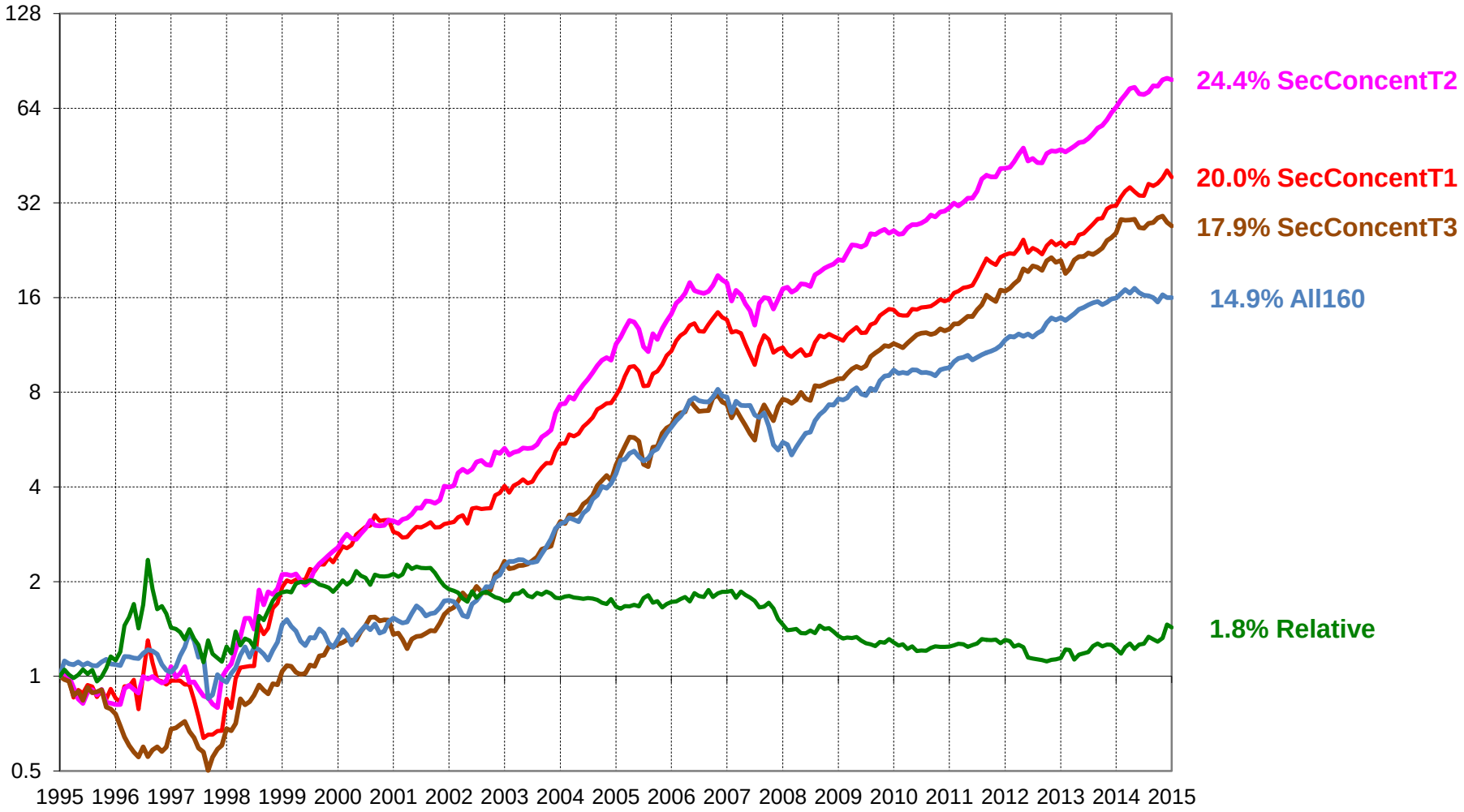
5.17 Total Sector Concentration

Figure 23: Graphical Time Series of Style: Total Sector Concentration



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5.17.1 Research Question One and Hypothesis One

It can be observed for the total sector concentration style from Figure 23 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (24.4% p.a.), tercile to one (20.0% p.a.) and tercile three (17.9% p.a.). Unlike total geographic concentration style, the results suggest that there is an optimal underlying property sector allocation.

Table 38: Portfolio Results: Friedman Test for Total Sector Concentration

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	2.058333	2	0.357305	No

From Table 38 the Chi-squared p-value of 35.73% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.17.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 9.5%.

Table 39: Market and Portfolio Results: Friedman Test for Total Sector Concentration

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.416667	1	0.518605	No
Tercile 2 (Best)	2	0.016667	1	0.897279	No
Tercile 3	2	1.666667	1	0.196706	No

From Table 39 the Chi-squared p-value of 89.73% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.17.3 Research Question Three

The slope of the price relative portfolio showed that most of tercile one's outperformance over tercile three was from 1996 to 1997 and from 1998 to 1999. Less noticeably tercile one has marginally outperformed tercile three from 2013 to 2015. Similar to total geographic concentration style, the style is currently supporting the benefits of a concentrated portfolio but the price relative portfolio suggests that some seasonality may exist, with concentration by sector currently in vogue.

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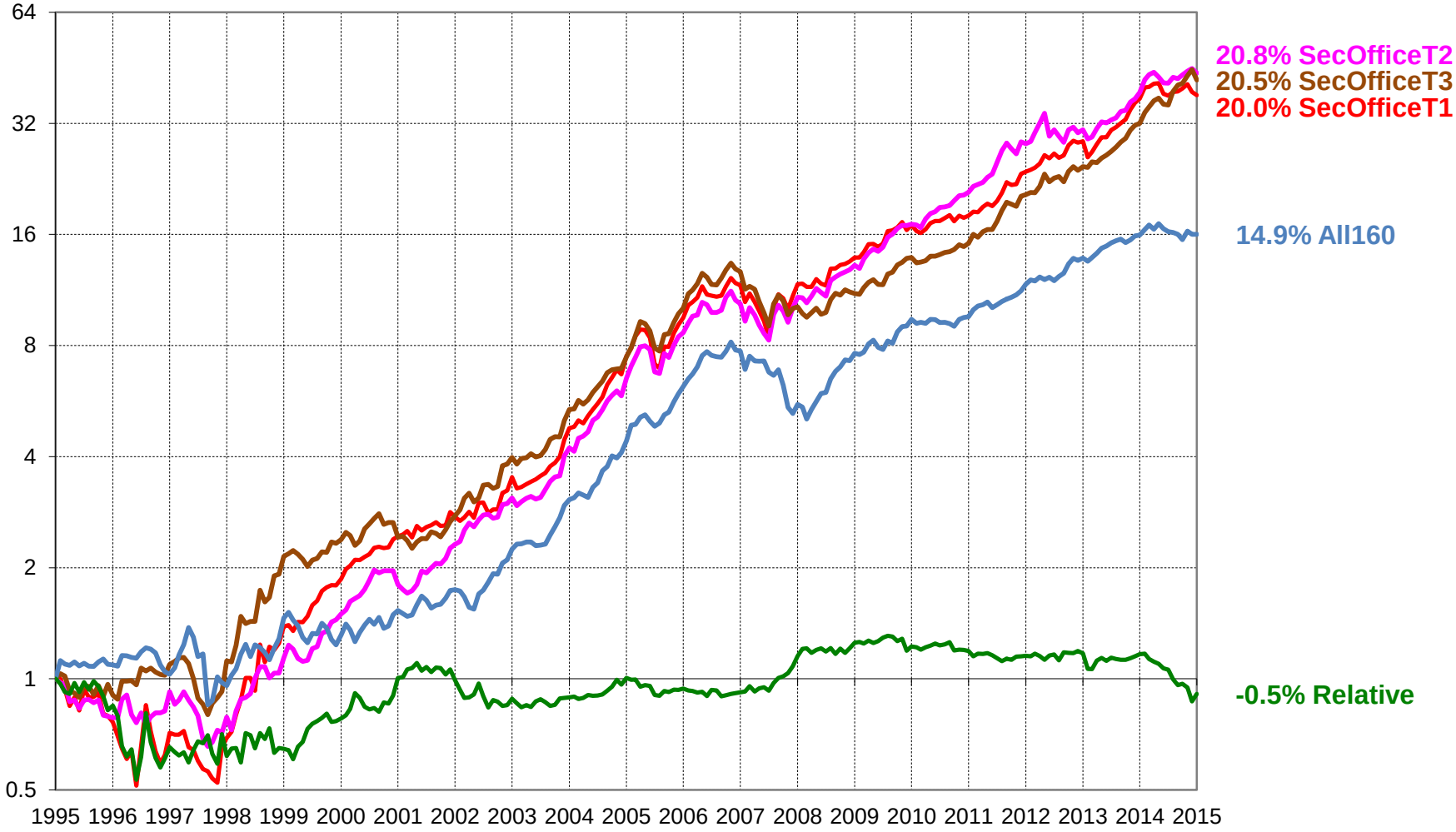
5.18 Sector: Office Percentage

Figure 24: Graphical Time Series of Style: Sector Office Percentage



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5.18.1 Research Question One and Hypothesis One

It can be observed for the sector office percentage style from Figure 24 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (20.8% p.a.), tercile one (20.5% p.a.) and tercile three (20.0% p.a.). According to IPD South Africa (2014), the annualised total return for the office sector over the last ten years has been 16.2%, underperforming retail (17.6%) and industrial (19.6%) but outperforming other (14.3%). The IPD South Africa (2014) data would suggest a preference to being underweight the office sector, the results from this study suggest that an optimal allocation to the office sector is preferable (tercile two) and that holding a low office percentage (tercile three) created no benefit.

Table 40: Portfolio Results: Friedman Test for Sector Office Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	1.975	2	0.372507	No

From Table 40 the Chi-squared p-value of 37.25% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.18.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 5.9%.

Table 41: Market and Portfolio Results: Friedman Test for Sector Office Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.066667	1	0.796253	No
Tercile 2 (Best)	2	2.816667	1	0.372507	No
Tercile 3	2	0.416667	1	0.518605	No

From Table 41 the Chi-squared p-value of 9.33% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.18.3 Research Question Three

The slope of the price relative portfolio showed most of tercile three's outperformance over tercile one was from 1995 to 1997 and from 2001 to 2003, but more recently from 2014 to 2015.

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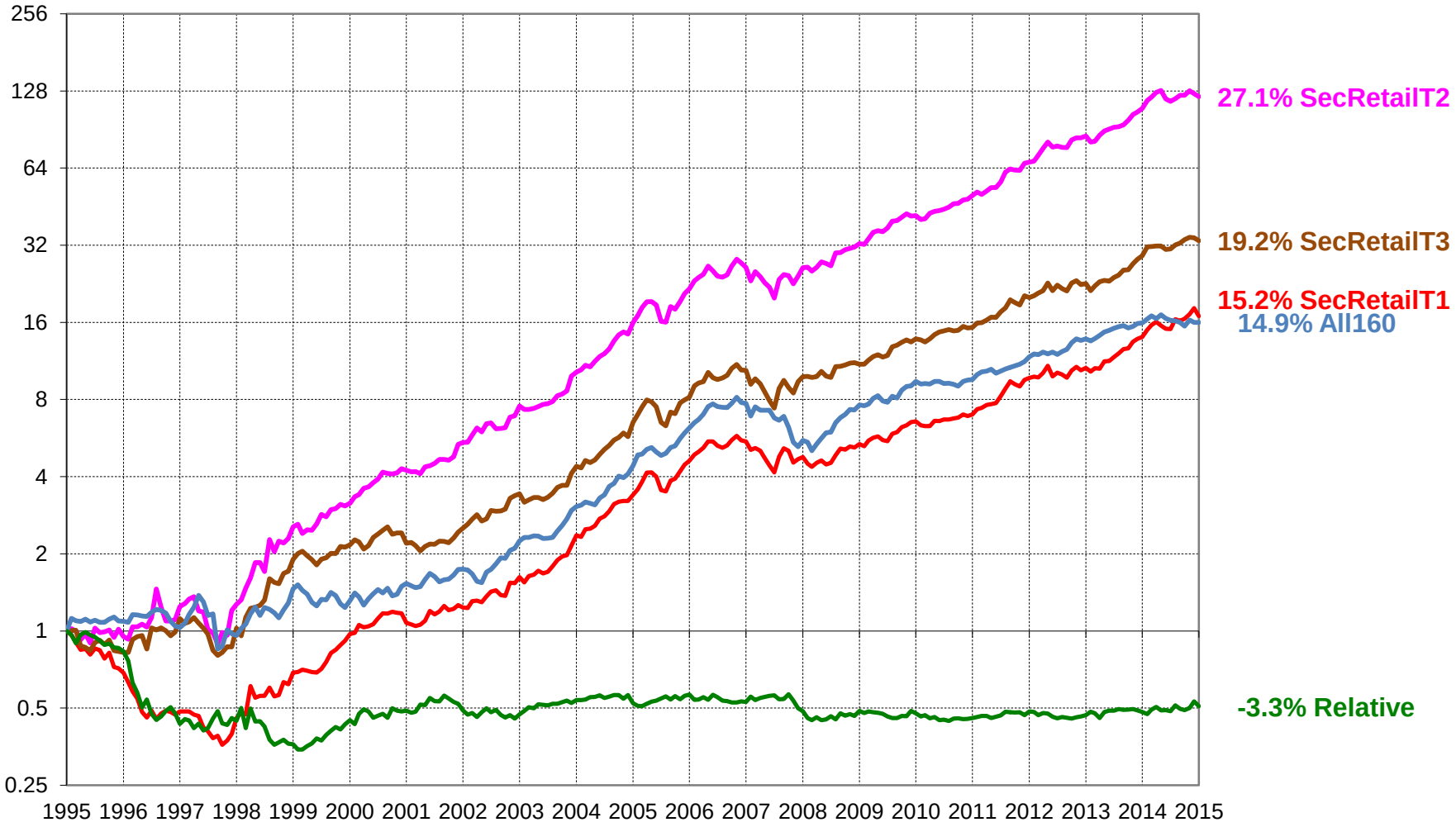
5.19 Sector: Retail Percentage

Figure 25: Graphical Time Series of Style: Sector Retail Percentage



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5.19.1 Research Question One and Hypothesis One

It can be observed for the sector retail percentage style from Figure 25 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (27.1% p.a.), tercile three (19.2% p.a.) and tercile one (15.2% p.a.). The results from this study suggest that an optimal allocation to the retail sector is preferable (tercile two) and are contrary to the IPD South Africa (2014) data for a preference to being overweight the retail sector, but much of the difference in performance was from returns prior to 1999.

Table 42: Portfolio Results: Friedman Test for Sector Retail Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	5.108333	2	0.077757	No

From Table 42 the Chi-squared p-value of 7.78% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.19.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.0%.

Table 43: Market and Portfolio Results: Friedman Test for Sector Retail Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.016667	1	0.897279	No
Tercile 2 (Best)	2	0.266667	1	0.605577	No
Tercile 3	2	0.600000	1	0.438578	No

From Table 43 the Chi-squared p-value of 60.56% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.19.3 Research Question Three

The slope of the price relative portfolio was mainly flat and tercile three's outperformance over tercile one was only from 1995 to 1999. The long period of flat behaviour of the price relative portfolio suggest that no persistence to the sector retail percentage style exists.

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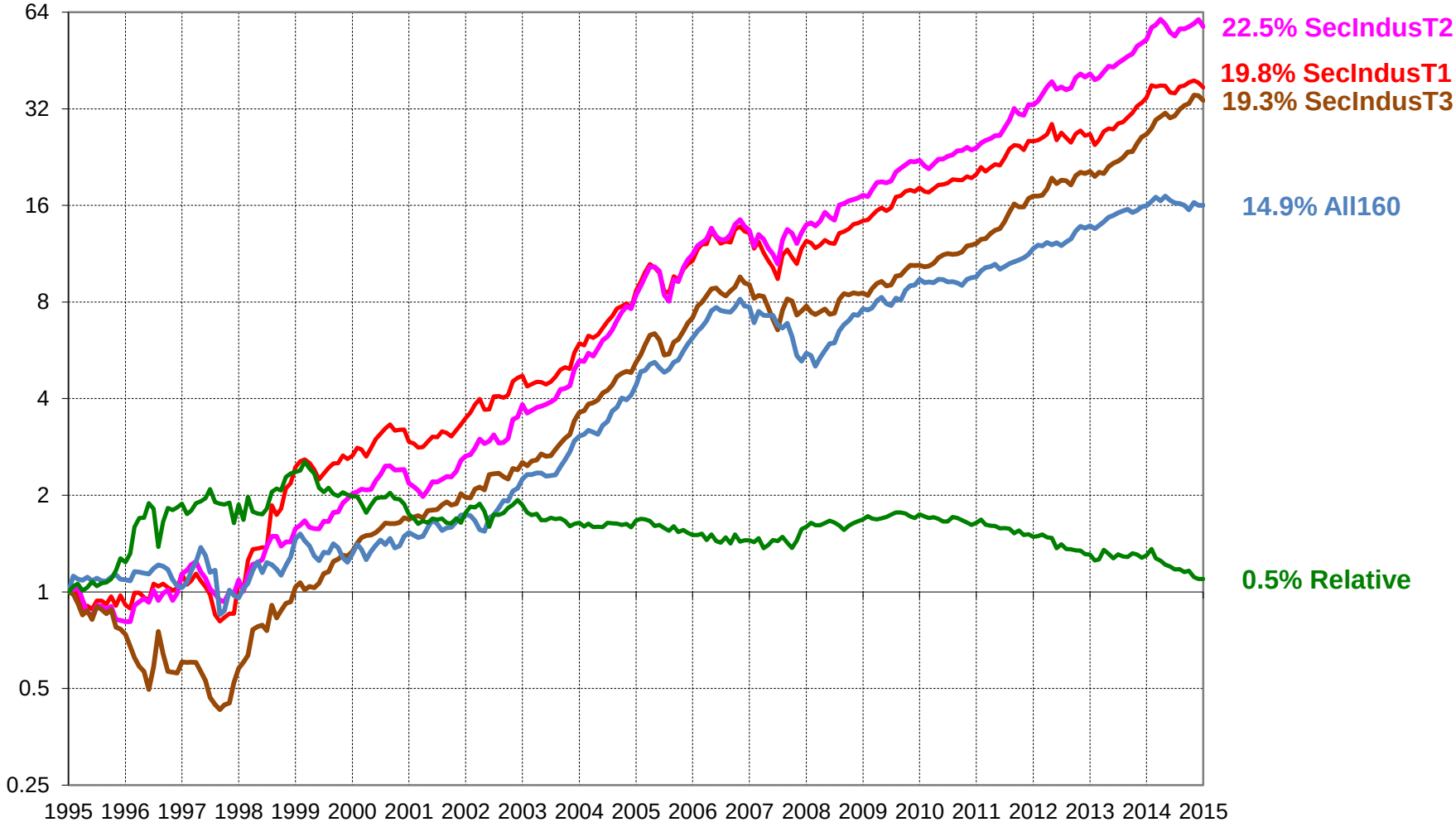
5.20 Sector: Industrial Percentage

Figure 26: Graphical Time Series of Style: Sector Industrial Percentage



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5.20.1 Research Question One and Hypothesis One

It can be observed for the sector industrial percentage style from Figure 26 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile two (22.5% p.a.), tercile three (19.8% p.a.) and tercile three (19.3% p.a.).

Table 44: Portfolio Results: Friedman Test for Sector Industrial Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	3.008333	2	0.222202	No

From Table 44 the Chi-squared p-value of 22.22% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.20.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile two) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 7.6%. Both the retail and office sector's best performing portfolios were also tercile two, suggesting that sector diversity should be through a mix of retail, office and industrial. Buchner (2008) argues that the property market fluctuates in a similar but lagged manner to economic cycles, this also suggests the need for property companies to have exposure to all sector types allowing them the ability to reduce the impact of economic cycles.

Table 45: Market and Portfolio Results: Friedman Test for Sector Industrial Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.266667	1	0.605577	No
Tercile 2 (Best)	2	1.350000	1	0.245278	No
Tercile 3	2	0.016667	1	0.897279	No

From Table 45 the Chi-squared p-value of 24.53% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile two and the market portfolio at a 5% level of significance.

5.20.3 Research Question Three

The slope of the price relative portfolio showed most of tercile one's outperformance over tercile three was from 1996 to 1999. But from 2010 tercile three has outperformed tercile one conflicting with IPD South Africa (2014) data that the industrial sector has been the best performing sector over the same period.

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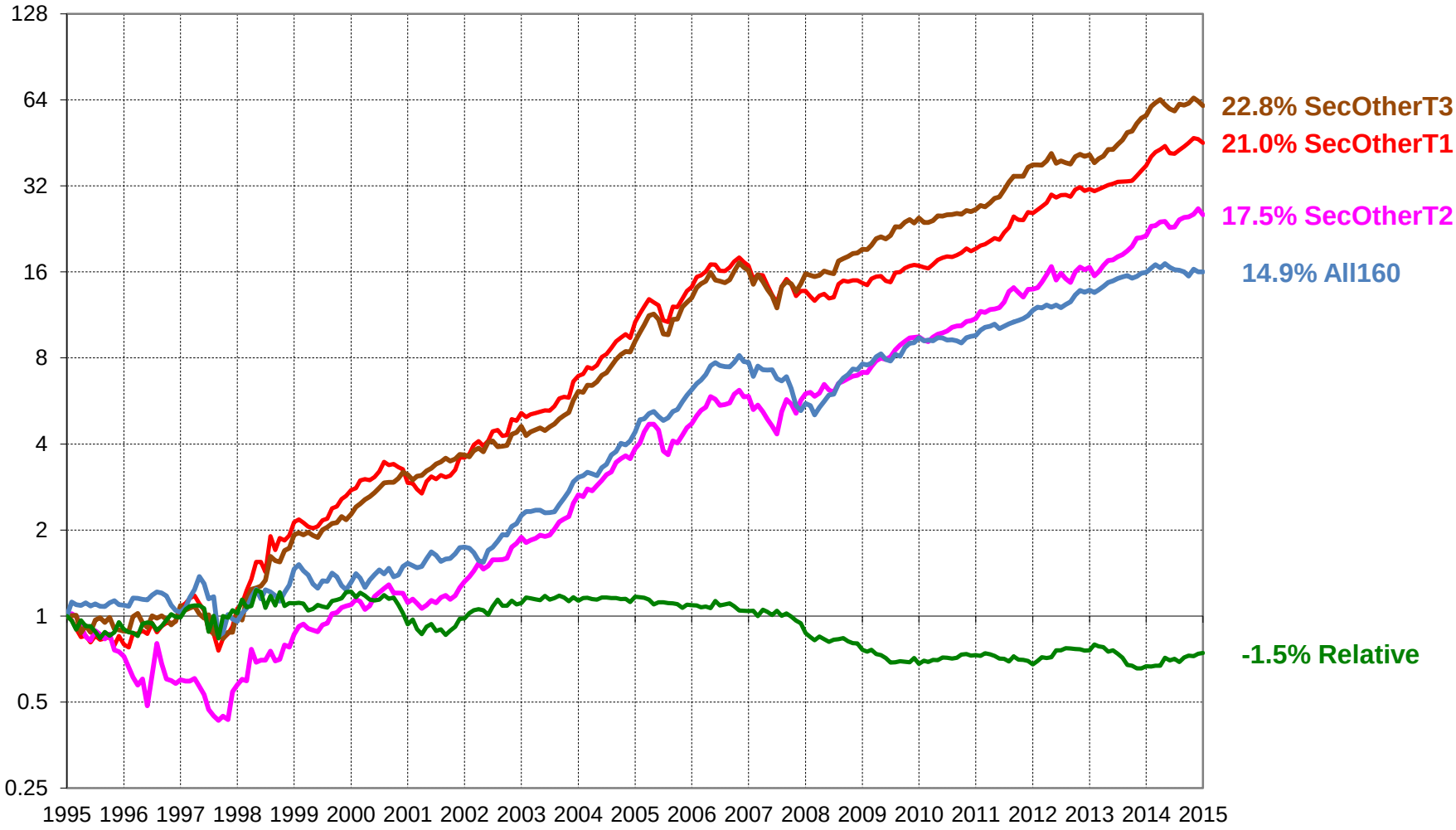
5.21 Sector: Other Percentage

Figure 27: Graphical Time Series of Style: Sector Other Percentage



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5.21.1 Research Question One and Hypothesis One

It can be observed for the sector other percentage style Figure 27 that no linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (22.8% p.a.), tercile one (21.0% p.a.) and tercile two (17.5% p.a.). The results from this study suggest a preference to being underweight the other sector which includes residential, student accommodation, hotels, hospitals, etc. The study supports the IPD South Africa (2014) which found the other sector to be the worst performing sector over one, three, five and ten years.

Table 46: Portfolio Results: Friedman Test for Sector Other Percentage

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	4.008333	2	0.134773	No

From Table 46 the Chi-squared p-value of 13.48% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.21.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 8.0%.

Table 47: Market and Portfolio Results: Friedman Test for Sector Other Percentage

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.816667	1	0.366157	No
Tercile 2	2	0.416667	1	0.518605	No
Tercile 3 (Best)	2	0.416667	1	0.518605	No

From Table 47 the Chi-squared p-value of 51.87% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.21.3 Research Question Three

The slope of the price relative portfolio was mainly flat and tercile three's outperformance over tercile one was only from 2000 to 2002 and from 2007 to 2010. The long period of flat behaviour of the price relative portfolio suggest that no persistence to the sector other percentage style exists.

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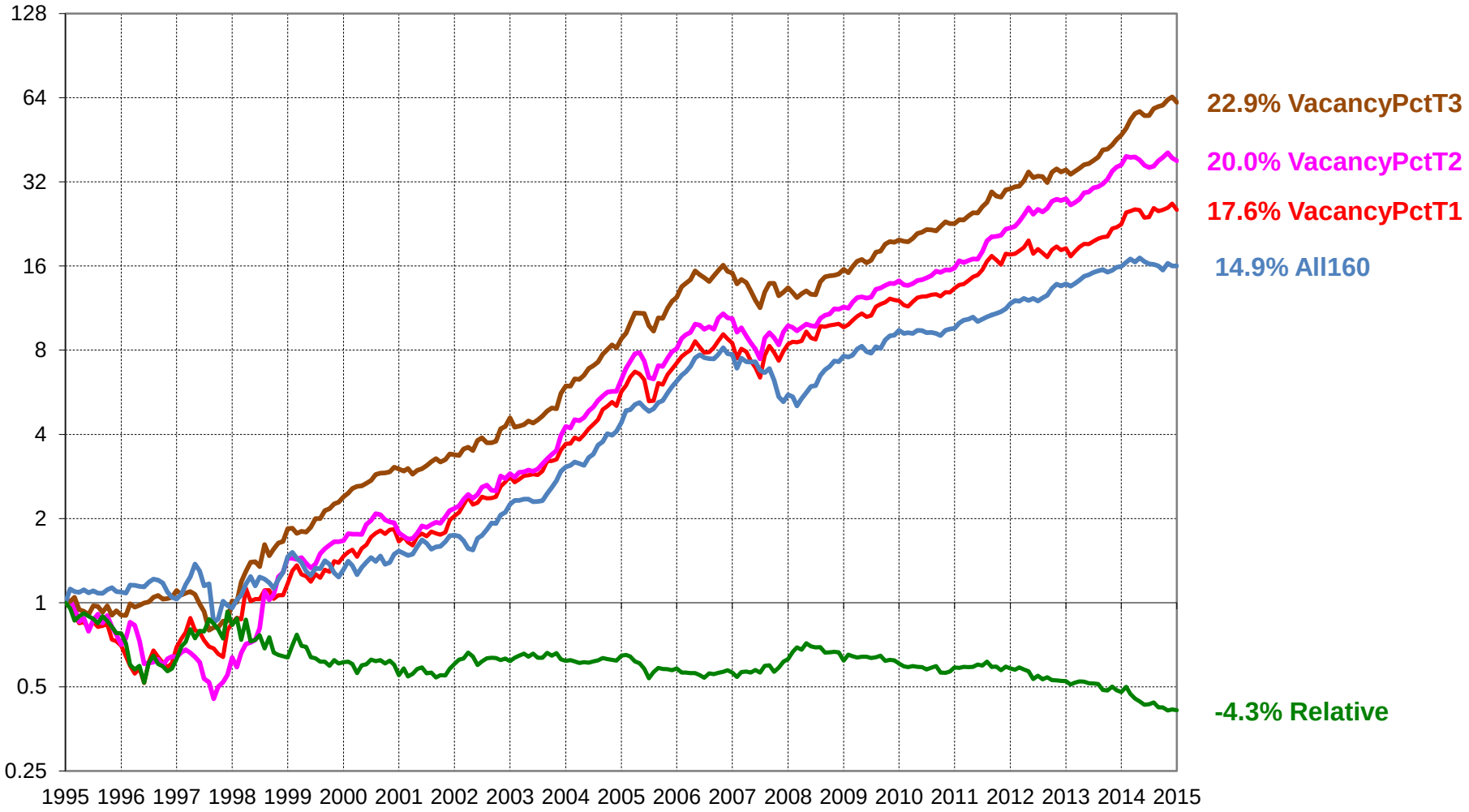
5.22 Vacancy Percentage of Portfolio

Figure 28: Graphical Time Series of Style: Vacancy Percentage of Portfolio



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5.22.1 Research Question One and Hypothesis One

It can be observed for the vacancy percentage of portfolio style from Figure 28 that that a linear performance ranking exists. The terciles are ranked in descending performance as follows: tercile three (22.9% p.a.), tercile two (20.0% p.a.) and tercile one (17.6% p.a.). It should however be noted that tercile two and tercile three have performed in a similar manner, suggesting that differences may only exist when considering companies with low vacancy rates (tercile three).

Table 48: Portfolio Results: Friedman Test for Vacancy Percentage of Portfolio

Number of Data Points (n)	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
240	3	5.233333	2	0.073046	No

From Table 48 the Chi-squared p-value of 7.30% is greater than 5% so the study fails to reject the Null hypothesis for hypothesis one i.e. there is no significant difference between the portfolios at a 5% level of significance.

5.22.2 Research Question Two and Hypothesis Two

The best performing portfolio (tercile three) outperformed the market portfolio. The spread between the best performing portfolio and the market portfolio was 8.0%.

Table 49: Market and Portfolio Results: Friedman Test for Vacancy Percentage of Portfolio

compared to Market	Number of Portfolios (k)	Friedman test statistic	Degrees of Freedom	Chi-squared p-value	Significance at 5% Level
Tercile 1	2	0.066667	1	0.796253	No
Tercile 2	2	0.066667	1	0.796253	No
Tercile 3 (Best)	2	0.066667	1	0.796253	No

From Table 49 the Chi-squared p-value of 79.63% was greater than 5% so the study fails to reject the Null hypothesis for hypothesis two i.e. there is no significant difference between tercile three and the market portfolio at a 5% level of significance.

5.22.3 Research Question Three

The slope of the price relative portfolio showed long persistence and that most of tercile three's outperformance over tercile one was from 1998 to 2002 and from 2008 to 2015. Persistence over the last seven years suggests investing in companies with low vacancy levels.

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5.23 Summary of Results

A summary of the results in relation to the research questions and hypotheses are presented in Table 50, Table 51 and Table 52.

Table 50: Summary of Results for Research Question One and Hypothesis One

No.	Style	Portfolio Performance			Spread Best to Worst	Ranking	Shape / Order	Hypothesis one p-value	Hypothesis one Significant
		T1	T2	T3					
1	Momentum	13.4%	24.7%	22.0%	11.3%	T2,T3,T1	Non-Linear	0.173051	No
2	Size (Market Capitalisation)	19.0%	18.5%	24.9%	6.4%	T3,T1,T2	Unclear	**0.011630**	Yes
3	Value Traded	19.2%	19.6%	22.5%	3.3%	T3,T2,T1	Linear	0.634977	No
4	Value Traded / Market Capitalisation	20.2%	23.2%	19.5%	3.7%	T2,T1,T3	Non-Linear	0.415129	No
5	Value (Earnings Yield)	23.0%	22.0%	17.9%	5.1%	T1,T2,T3	Linear	**0.045616**	Yes
6	Dividend Yield	23.1%	20.3%	19.4%	3.7%	T1,T2,T3	Linear	0.719523	No
7	Dividend Growth	18.5%	21.8%	18.6%	3.3%	T2,T3,T1	Non-Linear	0.454981	No
8	Price to NAV	21.0%	22.1%	24.9%	3.9%	T3,T2,T1	Linear	**0.090341**	No
9	Loan to Value	15.4%	19.0%	17.1%	3.6%	T2,T3,T1	Non-Linear	0.173774	No
10	Interest Cover Ratio	16.6%	19.5%	17.6%	2.9%	T2,T3,T1	Non-Linear	0.662683	No
11	Average Cost of Debt	21.6%	21.7%	19.6%	2.1%	T2,T1,T3	Unclear	0.627089	No
12	Total Geographic Concentration	26.1%	17.2%	19.4%	8.8%	T1,T3,T2	Non-Linear	0.145269	No
13	Geo: Gauteng Percentage	19.1%	20.2%	22.8%	3.7%	T3,T2,T1	Linear	0.659241	No
14	Geo: Western Cape Percentage	20.3%	16.4%	24.7%	8.4%	T3,T1,T2	Non-Linear	0.296216	No
15	Geo: South Africa Other Percentage	20.7%	22.2%	20.3%	1.9%	T2,T1,T3	Non-Linear	0.614160	No
16	Geo: International Percentage	25.3%	19.2%	19.2%	6.1%	T1,T2,T3	Linear	0.470402	No
17	Total Sector Concentration	20.0%	24.4%	17.9%	6.5%	T2,T1,T3	Non-Linear	0.357305	No
18	Sector: Office Percentage	20.0%	20.8%	20.5%	0.8%	T2,T3,T1	Non-Linear	0.372507	No
19	Sector: Retail Percentage	15.2%	27.1%	19.2%	11.9%	T2,T3,T1	Non-Linear	**0.077757**	No
20	Sector: Industrial Percentage	19.8%	22.5%	19.3%	3.2%	T2,T1,T3	Non-Linear	0.222202	No
21	Sector: Other Percentage	21.0%	17.5%	22.8%	5.3%	T3,T1,T2	Non-Linear	0.134773	No
22	Vacancy Percentage of Portfolio	17.6%	20.0%	22.9%	5.3%	T3,T2,T1	Linear	**0.073046**	No

p-value less than 10% in bold

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Table 51: Summary of Results for Research Question Two and Hypothesis Two

No.	Style	Best Performance	Market Performance	Spread Best to Market	Best Performing Tercile	Hypothesis two p-value	Hypothesis two Significant
1	Momentum	24.7%	14.9%	9.8%	T2	**0.093290**	No
2	Size (Market Capitalisation)	24.9%	14.9%	10.0%	T3	**0.052808**	No
3	Value Traded	22.5%	14.9%	7.6%	T3	**0.093290**	No
4	Value Traded / Market Capitalisation	23.2%	14.9%	8.4%	T2	**0.093290**	No
5	Value (Earnings Yield)	23.0%	14.9%	8.1%	T1	0.366157	No
6	Dividend Yield	23.1%	14.9%	8.2%	T1	0.438578	No
7	Dividend Growth	21.8%	14.9%	7.0%	T2	0.121335	No
8	Price to NAV	24.9%	14.9%	10.0%	T3	0.155580	No
9	Loan to Value	19.0%	12.6%	6.4%	T2	0.148915	No
10	Interest Cover Ratio	19.5%	12.6%	6.8%	T2	0.112351	No
11	Average Cost of Debt	21.7%	14.9%	6.8%	T2	0.366157	No
12	Total Geographic Concentration	26.1%	14.9%	11.2%	T1	0.155580	No
13	Geo: Gauteng Percentage	22.8%	14.9%	7.9%	T3	0.196706	No
14	Geo: Western Cape Percentage	24.7%	14.9%	9.9%	T3	0.155580	No
15	Geo: South Africa Other Percentage	22.2%	14.9%	7.3%	T2	0.245278	No
16	Geo: International Percentage	25.3%	14.9%	10.4%	T1	0.366157	No
17	Total Sector Concentration	24.4%	14.9%	9.5%	T2	0.897279	No
18	Sector: Office Percentage	20.8%	14.9%	5.9%	T2	0.372507	No
19	Sector: Retail Percentage	27.1%	14.9%	12.3%	T2	0.605577	No
20	Sector: Industrial Percentage	22.5%	14.9%	7.6%	T2	0.245278	No
21	Sector: Other Percentage	22.8%	14.9%	8.0%	T3	0.518605	No
22	Vacancy Percentage of Portfolio	22.9%	14.9%	8.0%	T3	0.796253	No

p-value less than 10% in bold

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Table 52: Summary of Results for Research Question Three

No	Style	Portfolio Performance		Price Relative Portfolio	Spread T1 to T3	Periods of Relative Performance T1 over T3 (Most Current Slope in Bold)		
		T1	T3			Outperformance	Flat	Underperformance
1	Momentum	13.4%	22.0%	-7.1%	-8.7%	**2011-2015**	1995-1996, 2001-2005, 2009-2011	1996-2001, 2005-2009
2	Size (Market Capitalisation)	19.0%	24.9%	-4.8%	-5.9%	2001	1995-1997, 1999-2001, **2008-2015**	1997-1999, 2001-2008
3	Value Traded	19.2%	22.5%	-2.7%	-3.3%	1999-2002	1995-1998, **2008-2015**	1998-1999, 2002-2008
4	Value Traded / Market Capitalisation	20.2%	19.5%	0.6%	0.7%	1997-2005	1995-1997	**2005-2015**
5	Value (Earnings Yield)	23.0%	17.9%	4.3%	5.1%	1997-2005, 2007-2010	1995-1997, **2010-2015**	2005-2007
6	Dividend Yield	23.1%	19.4%	3.1%	3.7%	1997-2001, 2001-2005	1995-1997, **2005-2015**	2001
7	Dividend Growth	18.5%	18.6%	-0.1%	-0.1%	1995-1996, 2001-2005, **2014-2015**	2005-2014	1996-2001
8	Price to NAV	21.0%	24.9%	-3.1%	-3.9%	1999-2001	1995-1997, **2008-2015**	1997-1999, 2001-2008
9	Loan to Value	15.4%	17.1%	-1.5%	-1.7%	1999-2001	2003-2007	2001-2003, **2007-2015**
10	Interest Cover Ratio	16.6%	17.6%	-0.9%	-1.1%	2001, 2008-2010	2010-2012	1999-2001, 2001-2008, **2012-2015**
11	Average Cost of Debt	21.6%	19.6%	1.6%	2.0%	1996-2002, 2007-2010	2002-2007	1995-1996, **2010-2015**
12	Total Geographic Concentration	26.1%	19.4%	5.5%	6.6%	1998-2002, **2011-2015**	1995-1998, 2002-2008	2008-2011
13	Geo: Gauteng Percentage	19.1%	22.8%	-3.0%	-3.7%	1998-2001, 2007-2008	2001-2007, 2008-2012	1995-1998, **2012-2015**
14	Geo: Western Cape Percentage	20.3%	24.7%	-3.5%	-4.4%	1998-2000	2000-2012	1995-1998, **2012-2015**
15	Geo: South Africa Other Percentage	20.7%	20.3%	0.4%	0.5%	1995-1999, 2008-2012	2001-2008	1999-2001, **2012-2015**
16	Geo: International Percentage	25.3%	19.2%	5.1%	6.1%	1995-2001, **2008-2015**	2005-2008	2001-2005, 2008
17	Total Sector Concentration	20.0%	17.9%	1.8%	2.1%	1996-1997, 1998-1999, **2013-2015**	1995-1996,1999-2007	1997-1998, 2007-2013
18	Sector: Office Percentage	20.0%	20.5%	-0.5%	-0.6%	1997-2001, 2007-2008	2003-2007, 2008-2014	1995-1997, 2001-2003, **2014-2015**
19	Sector: Retail Percentage	15.2%	19.2%	-3.3%	-4.0%	1999-2001	**2001-2015**	1995-1999
20	Sector: Industrial Percentage	19.8%	19.3%	0.5%	0.6%	1996-1999, 2008-2010	1995-1996	1999-2008, **2010-2015**
21	Sector: Other Percentage	21.0%	22.8%	-1.5%	-1.8%	2002-2003	1995-2000, 2003-2007, **2010-2015**	2000-2002, 2007-2010
22	Vacancy Percentage of Portfolio	17.6%	22.9%	-4.3%	-5.3%	1996-1998, 2008	2002-2008	1995-1996, 1998-2002, **2008-2015**

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6 Discussion of Results Collectively on Styles

The results are discussed in the order of the research questions and relevant hypotheses. Unlike Chapter 5 which presented the results by each style, this chapter deals with the styles collectively. Firstly, the 22 styles are ranked by relevant criteria to answer the research questions and then the 22 styles are discussed in relation to the literature for the four main style types investigated, namely: momentum, size, value and property specific.

6.1 Research Question One and Hypothesis One

Research question one investigates the consistency in returns of the style-based portfolios, while hypothesis one checks the equality of the returns of the portfolios to determine if there is a difference between the portfolios. By ranking Table 50 by the p-value from the Friedman test statistic for hypothesis one, the styles that have distinct portfolios can be determined. This was then compared with the order of the portfolios to determine if there was a consistency in return of the style-based portfolios.

Table 53: Results Sorted by p-value for Hypothesis One

Style	Ranking	Shape / Order	Hypothesis one p-value	Hypothesis one Significant
Size (Market Capitalisation)	T3,T1,T2	**Unclear**	**0.011630**	**Yes**
Value (Earnings Yield)	T1,T2,T3	**Linear**	**0.045616**	**Yes**
Vacancy Percentage of Portfolio	T3,T2,T1	**Linear**	**0.073046**	No
Sector: Retail Percentage	**T2**,T3,T1	Non-Linear	**0.077757**	No
Price to NAV	T3,T2,T1	**Linear**	**0.090341**	No
Sector: Other Percentage	T3,T1,T2	Non-Linear	0.134773	No
Total Geographic Concentration	T1,T3,T2	Non-Linear	0.145269	No
Momentum	T2,T3,T1	Non-Linear	0.173051	No
Loan to Value	**T2**,T3,T1	Non-Linear	0.173774	No
Sector: Industrial Percentage	T2,T1,T3	Non-Linear	0.222202	No
Geo: Western Cape Percentage	T3,T1,T2	Non-Linear	0.296216	No
Total Sector Concentration	T2,T1,T3	Non-Linear	0.357305	No
Sector: Office Percentage	T2,T3,T1	Non-Linear	0.372507	No
Value Traded / Market Capitalisation	T2,T1,T3	Non-Linear	0.415129	No
Dividend Growth	T2,T3,T1	Non-Linear	0.454981	No
Geo: International Percentage	T1,T2,T3	**Linear**	0.470402	No
Geo: South Africa Other Percentage	T2,T1,T3	Non-Linear	0.614160	No
Average Cost of Debt	T2,T1,T3	Unclear	0.627089	No
Value Traded	T3,T2,T1	**Linear**	0.634977	No
Geo: Gauteng Percentage	T3,T2,T1	**Linear**	0.659241	No
Interest Cover Ratio	**T2**,T3,T1	Non-Linear	0.662683	No
Dividend Yield	T1,T2,T3	**Linear**	0.719523	No

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From Table 53 only two styles, market capitalisation and earnings yield, had p-values low enough to reject the Null hypothesis, which states that the portfolios are the same i.e. there are only two styles that have differences between the portfolios at a 5% level of significance. Both the market capitalisation and earnings yield styles have been well documented to show strong associations with cross-sectional equity returns on the Johannesburg Stock Exchange (Hoffman, 2012). The order of the styles were linear and are in the correct order in line with the literature, with market capitalisation supporting the small size effect and earnings yield supporting the value effect. The results support Fama and French (1992) who found that market capitalization (size) and book-to-market ratios (value) were both significant in explaining the expected return of US equities.

Other styles with low p-values were vacancy percentage of portfolio and price to NAV. Sector retail percentage had a low p-value but the order was not linear, suggesting the need for an optimal allocation. Notably, momentum a style according to D. Page et al. (2013) which is popular in discrediting the theory of efficient markets and the CAPM, was not evident in this study. Other styles with high p-values but with linear orders were geographic international percentage, average cost of debt, value traded, geographic Gauteng percentage and dividend yield.

Although, interest cover ratio and loan to value are non-linear, C. Muller and Ward (2013) found that over-gearing creates financial stress and there is an optimal gearing level. This supports the notion that both interest cover ratio and loan to value should be non-linear and that tercile two should be their best performing portfolio, as found in this study.

6.2 Research Question Two and Hypothesis Two

Research question two investigates the performance of the style-based portfolios compared to the market portfolio, while hypothesis two checks the equality of the returns of the best performing portfolio with the market portfolio to determine if there is a difference between them. By ranking Table 51 by the p-value from the Friedman test statistic for hypothesis two, the styles that have their best performing portfolio distinct from the market portfolio can be determined. Table 51 was also ranked according to the spread between the best performing portfolio and the market to measure the magnitude of the difference of returns.

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Table 54: Results Sorted by p-value for Hypothesis Two

Style	Spread Best to Market	Best Performing Tercile	Hypothesis two p-value	Hypothesis two Significant
Size (Market Capitalisation)	10.00%	T3	**0.052808**	No
Momentum	9.80%	T2	**0.093290**	No
Value Traded	7.60%	T3	**0.093290**	No
Value Traded / Market Capitalisation	8.40%	T2	**0.093290**	No
Interest Cover Ratio	6.80%	T2	0.112351	No
Dividend Growth	7.00%	T2	0.121335	No
Loan to Value	6.40%	T2	0.148915	No
Price to NAV	10.00%	T3	0.155580	No
Total Geographic Concentration	11.20%	T1	0.155580	No
Geo: Western Cape Percentage	9.90%	T3	0.155580	No
Geo: Gauteng Percentage	7.90%	T3	0.196706	No
Geo: South Africa Other Percentage	7.30%	T2	0.245278	No
Sector: Industrial Percentage	7.60%	T2	0.245278	No
Value (Earnings Yield)	8.10%	T1	0.366157	No
Average Cost of Debt	6.80%	T2	0.366157	No
Geo: International Percentage	10.40%	T1	0.366157	No
Sector: Office Percentage	5.90%	T2	0.372507	No
Dividend Yield	8.20%	T1	0.438578	No
Sector: Other Percentage	8.00%	T3	0.518605	No
Sector: Retail Percentage	12.30%	T2	0.605577	No
Vacancy Percentage of Portfolio	8.00%	T3	0.796253	No
Total Sector Concentration	9.50%	T2	0.897279	No

Table 55: Results Sorted by Spread of Best Performing Portfolio and Market Portfolio

Style	Spread Best to Market	Best Performing Tercile	Hypothesis two p-value	Hypothesis two Significant
Sector: Retail Percentage	**12.30%**	T2	0.605577	No
Total Geographic Concentration	**11.20%**	T1	0.155580	No
Geo: International Percentage	**10.40%**	T1	0.366157	No
Size (Market Capitalisation)	**10.00%**	T3	0.052808	No
Price to NAV	**10.00%**	T3	0.155580	No
Geo: Western Cape Percentage	9.90%	T3	0.155580	No
Momentum	9.80%	T2	0.093290	No
Total Sector Concentration	9.50%	T2	0.897279	No
Value Traded / Market Capitalisation	8.40%	T2	0.093290	No
Dividend Yield	8.20%	T1	0.438578	No
Value (Earnings Yield)	8.10%	T1	0.366157	No
Sector: Other Percentage	8.00%	T3	0.518605	No
Vacancy Percentage of Portfolio	8.00%	T3	0.796253	No
Geo: Gauteng Percentage	7.90%	T3	0.196706	No
Value Traded	7.60%	T3	0.093290	No
Sector: Industrial Percentage	7.60%	T2	0.245278	No
Geo: South Africa Other Percentage	7.30%	T2	0.245278	No
Dividend Growth	7.00%	T2	0.121335	No
Interest Cover Ratio	6.80%	T2	0.112351	No
Average Cost of Debt	6.80%	T2	0.366157	No
Loan to Value	6.40%	T2	0.148915	No
Sector: Office Percentage	5.90%	T2	0.372507	No

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From Table 54 none of the styles had p-values low enough to reject the Null hypothesis, which states that the best performing portfolio and the market portfolio are the same i.e. there is no significant difference between the best performing and the market portfolio at a 5% level of significance for all of the styles. Styles with low p-values were market capitalisation, momentum, value traded and value traded as a percentage of market capitalisation. From Table 55 styles with the largest spreads between the best portfolio and the market portfolio were sector retail percentage, total geographic concentration, geographic international percentage, market capitalisation and price to NAV.

Notably, market capitalisation has both a low p-value and a large spread. This continues to support the small size effect already identified in research question one. However unlike research question one; momentum has a low p-value which suggests the ability to create a portfolio, using momentum as a variable, which can outperform the market. It should be noted that tercile two was the best performing portfolio for the momentum style, so when considering constructing portfolios to outperform the market it is not always the highest (tercile one) or lowest (tercile three) that would create the optimal portfolio.

Both value traded and value traded as a percentage of market capitalisation had low p-values which supports the existence of an illiquidity premium. Price to NAV had a large spread together with its low p-value for hypothesis one which supports the value effect. Property specific variables, sector retail percentage, total geographic concentration, geographic international percentage, all had large spreads suggesting that portfolios using these styles could be created to outperform the market portfolio.

Critically since none of the styles had p-values low enough to reject the Null Hypothesis, the existence of large spreads may be purely anecdotal given that the South African listed property sector has been the top performing asset class over the last 15 years (SA REIT Association & Grindrod Asset Management, 2015).

6.3 Research Question Three

Research question three investigates the persistence in return between high (tercile one) and low (tercile three) ranked portfolios. To do this a price relative portfolio was created as a ratio of the high portfolio divided by the low portfolio. By ranking Table 52 by the magnitude of the price relative portfolio, the styles with largest ratio differential

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were determined. More importantly this was then compared with the periods of long persistence (highlighted red in Table 56) and the most current slope of the ratio (bolded in Table 56).

From Table 56 styles with large price relative portfolios (by magnitude) were momentum, total geographic concentration, geographic international percentage, market capitalisation, earnings yield and vacancy percentage of portfolio. There is an overlap of findings with research question one for market capitalisation, earnings yield and vacancy percentage of portfolio. This further supports the strength and consistency of the ranking of the terciles for those styles. There is also an overlap of findings with research question two for momentum, total geographic concentration, geographic international percentage and market capitalisation, which further supports the potential to create outperforming portfolios for those styles.

When considering the slope and persistence of the price relative portfolio, momentum has had persistent periods of no performance difference (from 2001 to 2005 and from 2009 to 2011). However most recently tercile one has outperformed tercile three from 2011 to 2015, supporting the general literature of the momentum effect (Jegadeesh & Titman, 1993). But when looking at the whole period of investigation momentum had the largest relative price portfolio in the opposite direction to the general literature i.e. tercile three has outperformed tercile one by the largest magnitude of all styles.

Both total geographic concentration and geographic international percentage had persistent periods of no performance difference, from 2002 to 2008 and from 2005 to 2008, respectively. But more recently both styles have had tercile one outperform tercile three. Similarly, vacancy as a percentage of portfolio had persistent periods of no performance difference from 2002 to 2008. However for the last seven years tercile three has outperform tercile one, suggesting investing in companies with low vacancy levels.

Size had a persistent period of tercile three outperforming tercile one from 2001 to 2008 (in line with the small size effect). However for the last seven years there has been no performance difference. Similarly, earnings yield had a persistent period of tercile one outperforming tercile three from 1997 to 2005 (in line with the value effect). However for the last five years there has been no performance difference. Barberis and Shleifer (2003) advise that a style may disappear as they are discovered and become prominent. Both the size and value effect are well documented styles.

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Table 56: Results Sorted by magnitude of Price Relative Portfolio

Style	Price Relative Portfolio	T1 over T3 (Most Current Slope in Bold) (Strong Persistence in Red)		
		Outperformance	Flat	Underperformance
Momentum	**-7.10%**	**2011-2015**	1995-1996, 2001-2005, 2009-2011	1996-2001, 2005-2009
Total Geographic Concentration	**5.50%**	1998-2002, **2011-2015**	1995-1998, 2002-2008	2008-2011
Geo: International Percentage	**5.10%**	1995-2001, **2008-2015**	2005-2008	2001-2005, 2008
Size (Market Capitalisation)	**-4.80%**	2001	1995-1997, 1999-2001, **2008-2015**	1997-1999, 2001-2008
Value (Earnings Yield)	**4.30%**	1997-2005, 2007-2010	1995-1997, **2010-2015**	2005-2007
Vacancy Percentage of Portfolio	**-4.30%**	1996-1998, 2008	2002-2008	1995-1996, 1998-2002, **2008-2015**
Geo: Western Cape Percentage	-3.50%	1998-2000	2000-2012	1995-1998, **2012-2015**
Sector: Retail Percentage	-3.30%	1999-2001	**2001-2015**	1995-1999
Dividend Yield	3.10%	1997-2001, 2001-2005	1995-1997, **2005-2015**	2001
Price to NAV	-3.10%	1999-2001	1995-1997, **2008-2015**	1997-1999, 2001-2008
Geo: Gauteng Percentage	-3.00%	1998-2001, 2007-2008	2001-2007, 2008-2012	1995-1998, **2012-2015**
Value Traded	-2.70%	1999-2002	1995-1998, **2008-2015**	1998-1999, 2002-2008
Total Sector Concentration	1.80%	1996-1997, 1998-1999, **2013-2015**	1995-1996, 1999-2007	1997-1998, 2007-2013
Average Cost of Debt	1.60%	1996-2002, 2007-2010	2002-2007	1995-1996, **2010-2015**
Loan to Value	-1.50%	1999-2001	2003-2007	2001-2003, **2007-2015**
Sector: Other Percentage	-1.50%	2002-2003	1995-2000, 2003-2007, **2010-2015**	2000-2002, 2007-2010
Interest Cover Ratio	-0.90%	2001, 2008-2010	2010-2012	1999-2001, 2001-2008, **2012-2015**
Value Traded / Market Capitalisation	0.60%	1997-2005	1995-1997	**2005-2015**
Sector: Office Percentage	-0.50%	1997-2001, 2007-2008	2003-2007, 2008-2014	1995-1997, 2001-2003, **2014-2015**
Sector: Industrial Percentage	0.50%	1996-1999, 2008-2010	1995-1996	1999-2008, **2010-2015**
Geo: South Africa Other Percentage	0.40%	1995-1999, 2008-2012	2001-2008	1999-2001, **2012-2015**
Dividend Growth	-0.10%	1995-1996, 2001-2005, **2014-2015**	2005-2014	1996-2001

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6.4 Styles

6.4.1 Momentum Styles

The momentum style analysed was the total return over 12 months, the study found no linear relationship and no statistical significance at the 5% level and failed to reject the Null hypothesis for both hypothesis one and hypothesis two. The 12 month past performance period was found to be the optimal period by C. Muller and Ward (2013). Also, Novy-Marx (2012) showed that periods of seven to 12 month past performance lookback periods outperformed shorter lookback periods.

The results of this study are contrary to the vast body of literature that has been observed in international markets (Asness et al., 2013; Chui et al., 2010; Fama & French, 2010, 2012; Hou et al., 2011) and in South Africa (C. Muller & Ward, 2013; van Rensburg & Robertson, 2003; van Rensburg, 2001). This is especially interesting as C. Muller and Ward (2013) found that momentum was the most profitable of all styles they examined. It is worth noting that in this study, the momentum style has the largest spread (11.30%) between the best (tercile two) and worst (tercile one) portfolios of all the styles investigated and that tercile one's performance (13.40%) was the worst of all terciles investigated. Also more recently, since 2011, tercile one has outperformed tercile three which does support C. Muller and Ward (2013) but over the whole period of investigation the opposite has been the overriding theme.

Boudry et al. (2012) found that REITs have characteristics of stocks and bonds. The pseudo stock and bond nature of listed property companies may explain the lack of a momentum style. Jegadeesh and Titman (1993) showed that stocks that have done well over the past year tended to continue to do well, but surmising from the bond nature found by Boudry et al. (2012) this could cause listed property companies that have had recent excessive performance to be "pulled back" to their pseudo bond "par" value. This "pull back" effect could be due to the fact that many fund managers and analysts closely follow the yield of listed property companies (SA REIT Association, n.d.). However this view is contrary to Stevenson (2002) who found the momentum effect in international real estate securities.

6.4.2 Size Styles

The size styles analysed were market capitalisation, value trade and value traded as a percentage of market capitalisation. The study found that the market capitalisation style analysed had a linear relationship and statistical significance at the 5% level to reject the Null hypothesis for hypothesis one. The value traded style had a linear relationship

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and a low p-value for hypothesis two while the value traded as a percentage of market capitalisation had no linear relationship but a low p-value for hypothesis two. As previously discussed in sections 5.2 Size, 5.3 Value Traded and 5.4 Value Traded / Market Capitalisation, the study supports the small size effect and to a lesser extent the existence of an illiquidity premium. However since 2008 neither market capitalisation nor value traded have shown any performance difference between tercile one and tercile three, while value traded as a percentage of market capitalisation has shown persistence supporting an illiquidity premium since 2005.

The evidence of the size effect in South Africa is mixed; with C. Muller and Ward (2013) contending that the inconsistency of South African studies is because some of the local studies suffered from data related problems, and as such the need to re-examine styles using their “improved methodology and data set” (C. Muller & Ward, 2013, p. 1). This study used the “improved methodology and data set” of C. Muller and Ward (2013) yet found evidence of the small size effect which is contrary to their findings.

Banz (1981) proposed source for the small size effect was that little information is known about smaller stocks, and the excess returns are compensation for this lack of information. This study’s overall findings supports Banz (1981), but the study also shows that the small size effect is not evident after 2008. As the South African listed property sector has grown from a market capitalisation of R15 billion in 1995 to a market capitalisation of R665 billion by 2015 (iNET Bridge, 2015; Muller & Ward database, 2015) and that more than 38 fund managers specialise in the listed property sector (MoneyMate database, 2015) may explain the lack of the small size effect after 2008 as the smaller stocks in the listed property sector are now well followed and the “lack of information” risk premium is no longer evident. Barberis and Shleifer (2003) suggest that styles disappear as a consequence of them being discovered and becoming prominent.

6.4.3 Value Styles

The value styles analysed were earnings yield, dividend yield, dividend growth and price to NAV. The study found that the earnings yield style analysed had a linear relationship and statistical significance at the 5% level to reject the Null hypothesis for hypothesis one. The price to NAV style had a linear relationship and a low p-value for hypothesis one and a large spread to the market portfolio. Dividend yield had a linear relationship but dividend growth had a non-linear relationship.

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The study supports the vast research supporting the value effect internationally (Asness et al., 2013; Chui et al., 2010; Fama & French, 2010, 2012; Hou et al., 2011) as well as on the JSE (Auret & Cline, 2011; Auret & Sinclaire, 2006; Basiewicz & Auret, 2009; Hoffman, 2012; C. Muller & Ward, 2013; D. Page & Auret, 2014; M. J. Page & Palmer, 1993; M. J. Page, 1996; Strugnell et al., 2011; van Rensburg & Robertson, 2003; van Rensburg, 2001)

However, all of the value styles have shown no performance difference in the last five years, with earnings yield having no performance difference since 2010, dividend yield since 2005, dividend growth since 2005 and price to NAV since 2008. This is similar to C. Muller and Ward (2013) who found that the price to book style initial performed well but since 2004 has had no performance difference, but this is contrary to C. Muller and Ward (2013) who found earnings yield to still show performance differences.

Notably the results for dividend yield were linear and in line with the findings of earnings yield but the relationship was not as strong with dividend yield having the largest (worst) p-value for hypothesis one. As previously mentioned in section 5.6 Dividend Yield, property analysts follow dividend yield more closely than earnings yield (SA REIT Association, n.d.) and Barberis and Shleifer (2003) advise that a style may disappear as they are discovered and become prominent.

6.4.4 Property Specific Styles

The property styles analysed can be split into four areas of interest, namely:

1. Debt or leverage made up of the styles: loan to value, interest cover ratio and average cost of debt.
2. Geographic property exposure made up of the styles: total geographic concentration, geographic Gauteng percentage, geographic Western Cape percentage, geographic South Africa other percentage and geographic international percentage.
3. Sector property exposure made up of the styles: total sector concentration, sector office percentage, sector retail percentage, sector industrial percentage and sector other percentage.
4. Property underlying performance made up of the style: vacancy percentage of portfolio.

The following property specific styles exhibited relevance: vacancy percentage of portfolio, sector retail percentage, loan to value, interest cover ratio, total geographic concentration and geographic international percentage.

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The best performing portfolio for all three debt styles was tercile two, which supports C. Muller and Ward (2013) and the general literature of an optimal interest cover ratio. Specifically, the study found that the interest cover ratio style had a low p-value for hypothesis two. However, opposite to analyst expectations, companies that have the lowest average cost of debt produce the least profitable portfolio.

Both, total geographic concentration and geographic international percentage styles have shown persistent outperformance of tercile one over tercile three in the last five years. The total geographic concentration contradicts the current literature of the benefits of diversification. Haß et al. (2012), Kallberg et al. (2000), Lee and Stevenson (2007) and Shen et al. (2012) all found diversification benefits when including listed property in investors' portfolios, however our study suggests that when selecting the underlying listed property companies it is better to have property companies with concentrated portfolios by geographic location. The study is contrary to Cici et al. (2011) who examined geographic concentration of underlying properties but was unable to show that this as a profitable style.

The geographic international percentage style supports the current market trend where companies are increasing their international exposure (Anderson, 2015; J. Muller, 2015). However, all other geographic styles showed no persistence or meaningful relationship or p-values, suggesting that the assembly of a portfolio by geographic location in South Africa is less important than the need for it to be more concentrated in one location or having an international exposure.

The study shows that total sector concentration is not as important total geographic concentration, and only the sector retail percentage style featured as a style with low p-value for hypothesis one and the highest spread to the market portfolio (12.30%). However, the sector retail percentage style was non-linear and its best performing portfolio was tercile two. The sector retail percentage style has also had a persistent period of no performance difference from 2001.

Vacancy percentage of portfolio had a linear relationship and low p-value for hypothesis one. Persistence over the last seven years suggests investing in companies with low vacancy levels which supports analyst expectations that companies with lower vacancy levels have better management or better quality underlying properties (SA REIT Association, n.d.).

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7 Conclusions

7.1 Principle Findings and Implications

The study attempted to investigate the effects that style-based variables had on the returns of South African listed property companies and found specific portfolios constructed on the basis of ranked style-variables exhibited significant effects over the period. The study has contributed to the current body academic literature by firstly focusing on the South African listed property sector and then by including more styles based on property specific variables.

The study reinforced the current body of academic literature by finding significant excess returns and linear relationships with respect to the value effect and small size effect. Both earnings yield and price to NAV styles supported the concept of “value investing” which is a popular investment approach among fund managers (Graham & Dodd, 1934). However fund managers and analysts in the listed property sector particularly focus on dividend yield and dividend growth (SA REIT Association, n.d.). Since investors and fund managers will seek to uses styles-based strategies to outperform the market (C. Muller & Ward, 2013), they would be better advised to follow earnings yield and price to NAV styles which were found to be more meaningful than dividend yield and dividend growth. Investors and fund managers should however be cautioned that the value effect has most recently not shown persistent outperformance.

The small size effect has had mixed findings in the South African academic literature. This study supported the existence of the small size effect using market capitalisation with the “improved methodology and data set” of C. Muller and Ward (2013). Also, the existence of illiquidity premium using the value traded and value traded as a percentage of market capitalisation was found to a lesser extent. From these findings investors and fund managers should be able to construct profitable portfolios within smaller sized listed property companies without necessarily having to increase illiquidity risk to generate excess returns. Although there was a link to illiquidity premium the small size effect was more pertinent. Investors and fund managers should however be cautioned that the small size effect has most recently not shown persistent outperformance, yet illiquidity premium has most recently continued to show persistence.

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The study contradicts the current body of academic literature by finding no linear relationships with respect to momentum. This is important as momentum has been found to be the most prevalent of all styles (C. Muller & Ward, 2013). Investors and fund managers should be cautioned to use strategies based on momentum in the listed property sector.

The study supported the theory on capital structures and that there is an optimal gearing level for companies. Both the interest cover ratio and loan to value styles found that their best performing portfolio was tercile two, showing that property companies should not be over-geared or under-geared, but rather a mid-range optimal gearing is ideal.

Many fund managers and analysts in the listed property sector particular focus on property specific variables (SA REIT Association, n.d.). This study found little evidence supporting the use of most of the property specific variables investigated. Only three styles were found to be meaningful, namely: total geographic concentration, geographic international percentage and vacancy percentage of portfolio styles. Buchner (2008) advised that some of the benefits of listed property companies are diversification of the property investments through exposure to multiple: buildings, tenants, lease expiry profiles, property sectors and geographies. The study found to the contrary that geographic concentration is preferable to geographic diversity, unless the diversity is through more international exposure. Also, no benefits were found from sector diversity. Investors and fund managers will need to reconsider the important metrics they track (SA REIT Association, n.d.) since the study found very few to be of any meaningful differentiation. However the vacancy percentage of portfolio style had a linear relationship and investments in companies with high occupancy (low vacancy) most recently has shown persistence.

7.2 Research Limitations

The research had the following limitations:

- Sample sizes were a large limitation of the research. Prior to 2000 there were very few property companies that passed the liquidity screening. As such many of the portfolios constructed had less than three underlying counters in the early years of the study period.

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- The portfolios were constructed starting at a specific point in time (31 December 1995). Had the portfolios been constructed at a different point in time (say after 2000) this may have produced different results, and possibly different conclusions. Similarly, the portfolios were constructed using an equal weighting, using a market capitalisation weighting would have produced different results, and possibly different conclusions.

- The liquidity screening used a conveniently chosen deflation adjusted one million rand value, this resulted in using a non-probability sampling method. Therefore, this sampling method may have reliability issues as it introduced biases into the sample selection (Saunders et al., 2012).

- Reporting standards changed over the period of the study. There was incomplete data for some of the property specific variables chosen in the earlier years of the study period. Also some subjectivity was required when capturing some of the earlier data as the companies did not always use the same methodology and structure when reporting.

- While many property specific variables were investigated, other property specific variables were ignored, e.g. percentage of debt fixed, lease expiry profile. As a result, this research was not all encompassing.

- The study did not cater for transaction costs, taxes, rights issues, nil paid letters of allocation, intraday trading, and spreads between bid and ask prices. This means that the results would not have been a true reflection of the returns that would have been earned by each portfolio in reality. Also, the study looked at total cumulative returns but not at performance in terms of risk-adjusted returns.

- The Friedman test was used rather than other statistical test such as the Wilcoxon Rank Sum paired t-test. The Friedman test converts the numeric ratio data from the lognormal returns into discrete ordinal data (Daniel, 1990). The study found only two instances of rejecting the Null hypothesis for hypothesis one and no instances of rejecting the Null hypothesis for hypothesis two. Using a different statistical test may have produced different results, and possibly different conclusions.

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- The study used an equal weighted top 160 equity portfolio as the market portfolio. A market portfolio created only from the listed property companies or the FTSE/JSE SA Listed Property Index - J253T may have produced different results, and possibly different conclusions for research question two and hypothesis two. It should however be noted that the FTSE/JSE SA Listed Property Index - J253T did not exist for the full period of the study.

7.3 Recommendations for Further Research

7.3.1 Other Property Specific Variables

This research focused on only some property specific variables reported by listed property companies in South Africa. It may be valuable to perform further research in the field of property specific style-based variables not investigated by this study such as percentage of debt fixed and lease expiry profile.

7.3.2 Other Fundamental Variables applied to the Listed Property Sector

This research focused on only a few of fundamental variables typical studied in style-based research. It may be valuable to perform further research on the listed property sector with the fundamental variables not investigated by this study such as return on capital, return on equity, net asset growth, cash-flow over price.

7.3.3 Deeper Analysis of Momentum

This research found momentum using a 12 month lookback period and three month holding period to not be an effective style, contrary to most academic research. It may be valuable to perform further research on the listed property sector varying the lookback period and holding period for the momentum style to better understand why momentum has not been effective in the South African listed property sector

7.3.4 Bond Nature of Property

Boudry et al. (2012) found that REITs have characteristics of stocks and bonds. It was proposed that the pseudo stock and bond nature of listed property companies may explain the lack of a momentum style, suggesting that recent excessive performance by property companies maybe “pulled back” to their pseudo bond “par” value. Further research is required to determine if this assertion has any validity.

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7.3.5 Optimal Gearing Levels

This research supported the academic literature for an optimal gearing level. Most South African property companies are considered conservatively geared with loan to value ratios below 50% (SA REIT Association, n.d.). It may be valuable to perform further research on understanding the optimal gearing level for the South African listed property companies as current property companies use this industry standard of below 50% without any academic grounds.

7.3.6 Combination Styles

C. Muller and Ward (2013) found that a combination style of their most relevant styles gave the overall best results. It may be valuable to perform further research on using a combination style of the most relevant styles investigated in this study.

7.3.7 Reconstruction of the FTSE/JSE SA Listed Property Index - J253T

C. Muller and Ward (2013) were able to reconstruct the FTSE/JSE Africa All Share Index - J203T to test the robustness and data integrity of their database. It may be valuable to reconstruct the FTSE/JSE SA Listed Property Index - J253T to test the robustness and data integrity of the database used to perform this study, especially since many smaller companies were used from the database for the early years of the study period.

7.4 Conclusion

This study has contributed to the body of knowledge regarding style-based investment strategies in the South African listed property sector. It is believed that this study will help business specialists have academic grounds as to why they should track certain property specific variables while disregard other property specific variables. With the growth of the property sector and broader investor interest in this unique asset class, it is hoped that further academic research specialising on the listed property sector is conducted. The researcher hopes that this study makes a useful contribution to the academic literature in this field of research.

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APPENDIX A: Number of Constituents per a Portfolio

Figure 29: Number of Constituents per Portfolio (tercile) for Momentum

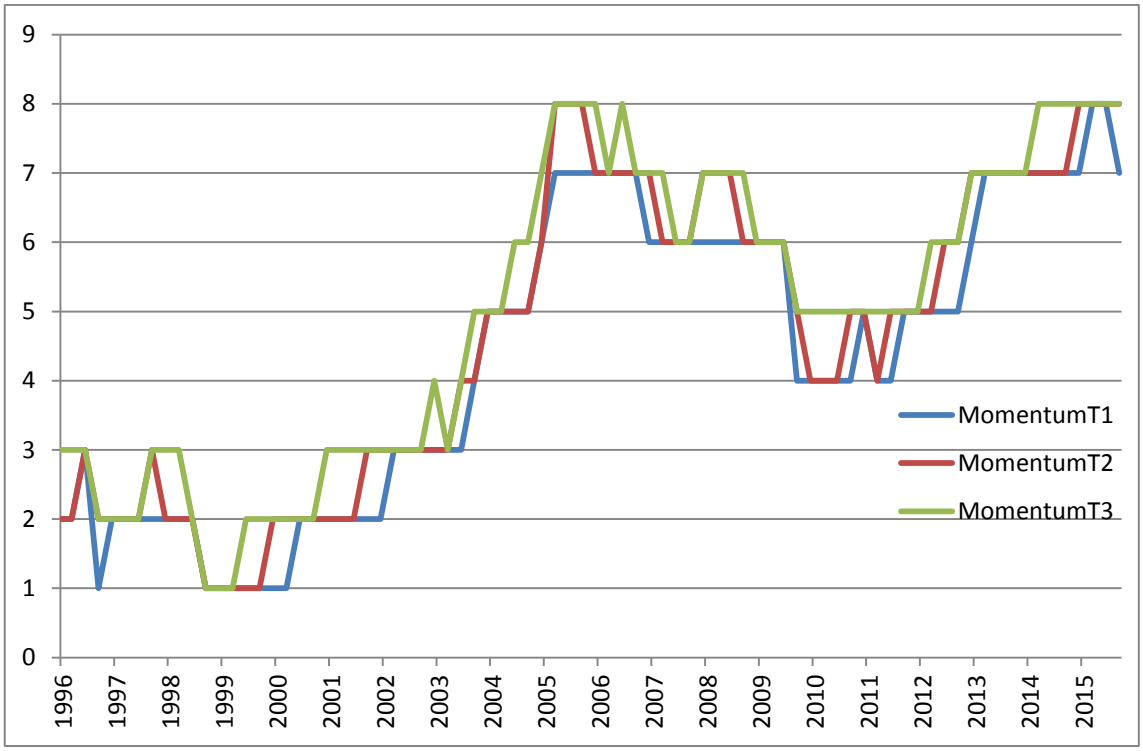

Figure 30: Number of Constituents per Portfolio (tercile) for Size

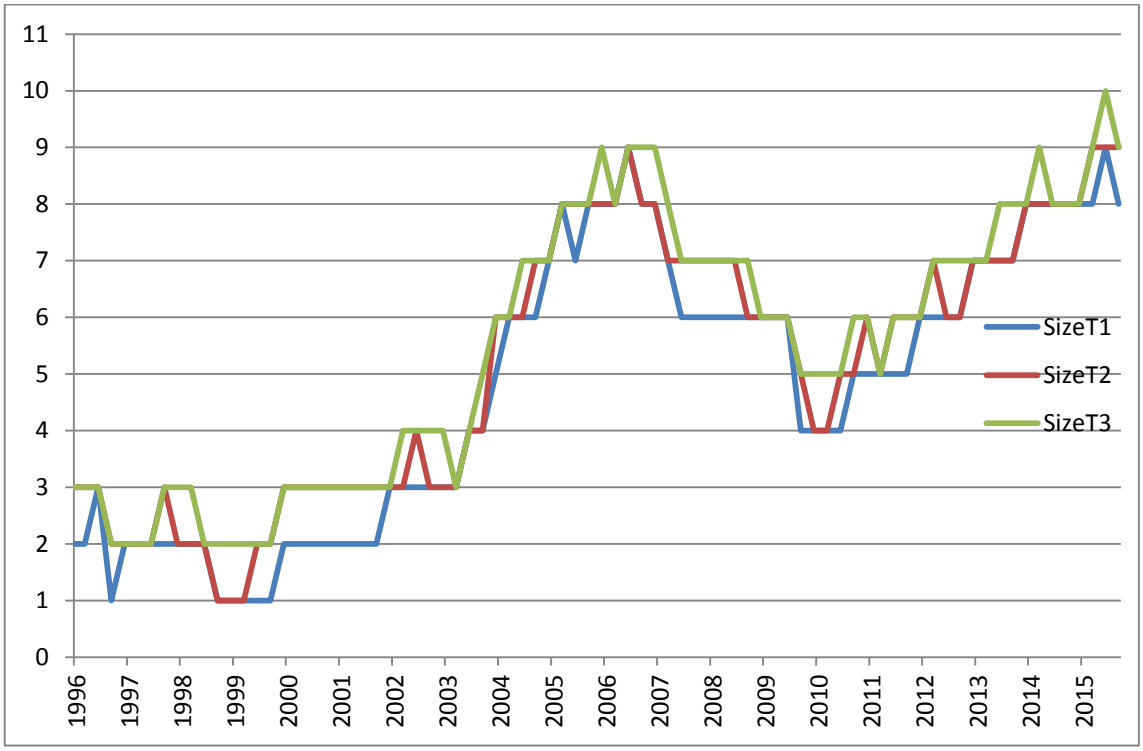

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Figure 31: Number of Constituents per Portfolio (tercile) for Value Traded

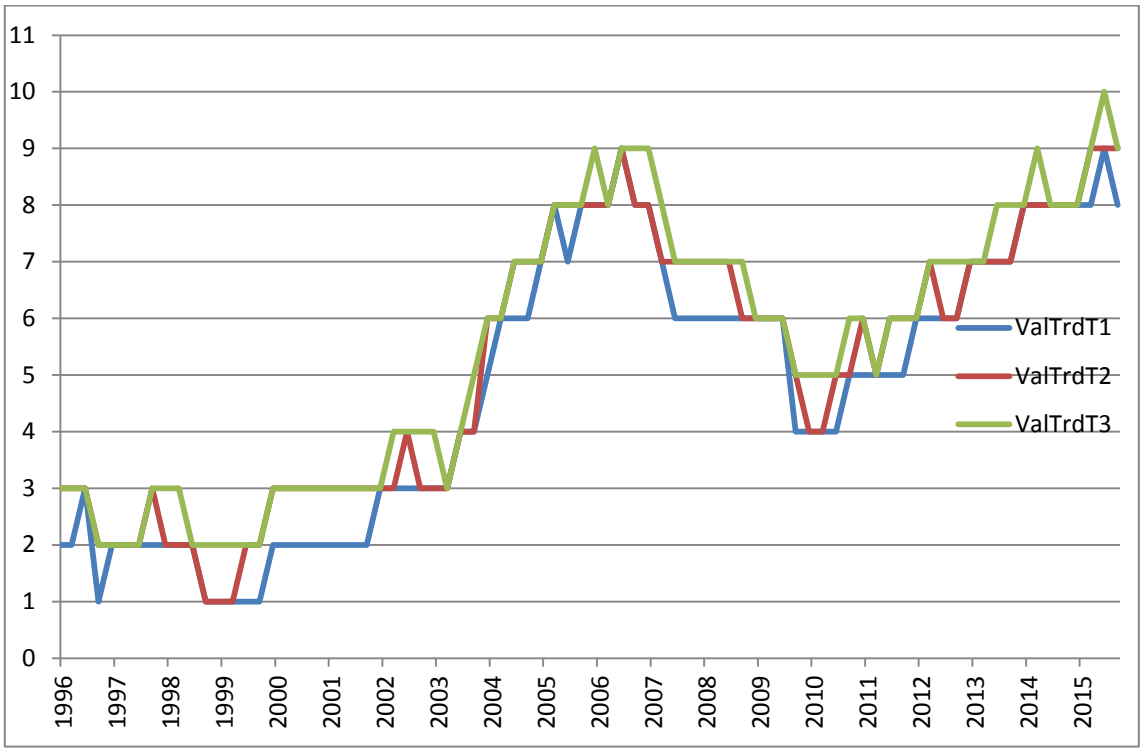

Figure 32: Number of Constituents per Portfolio (tercile) for Value Traded percentage of Market Capitalisation

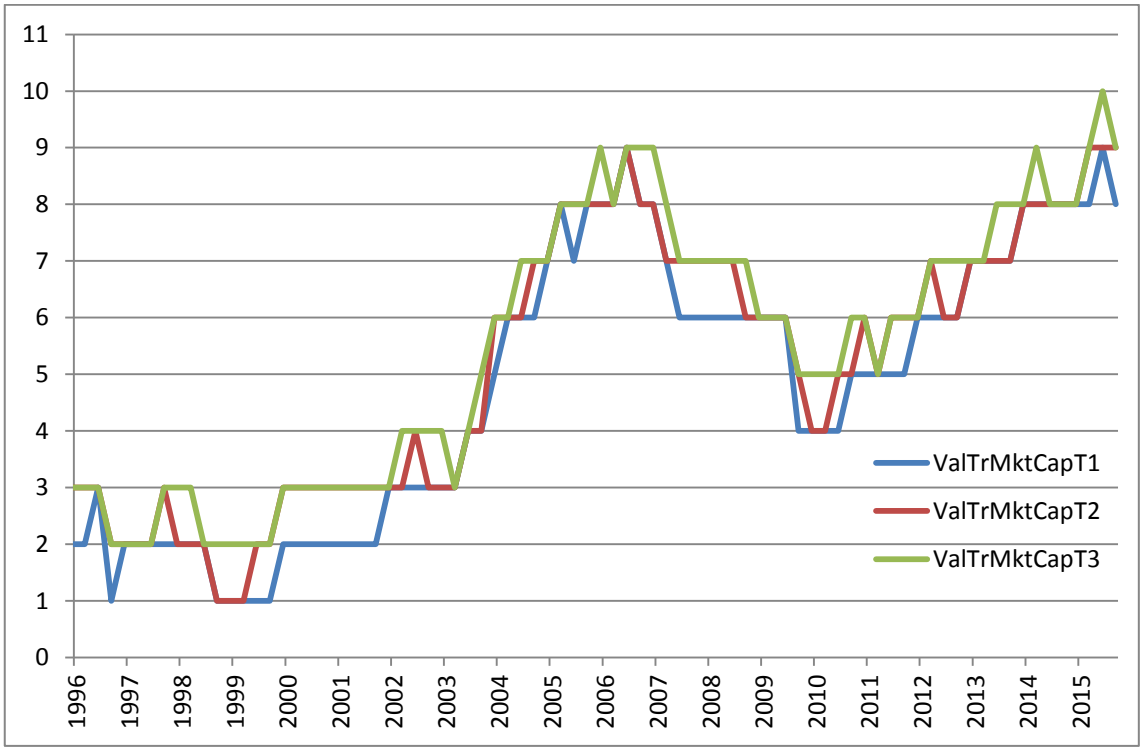

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Figure 33: Number of Constituents per Portfolio (tercile) for Earnings Yield

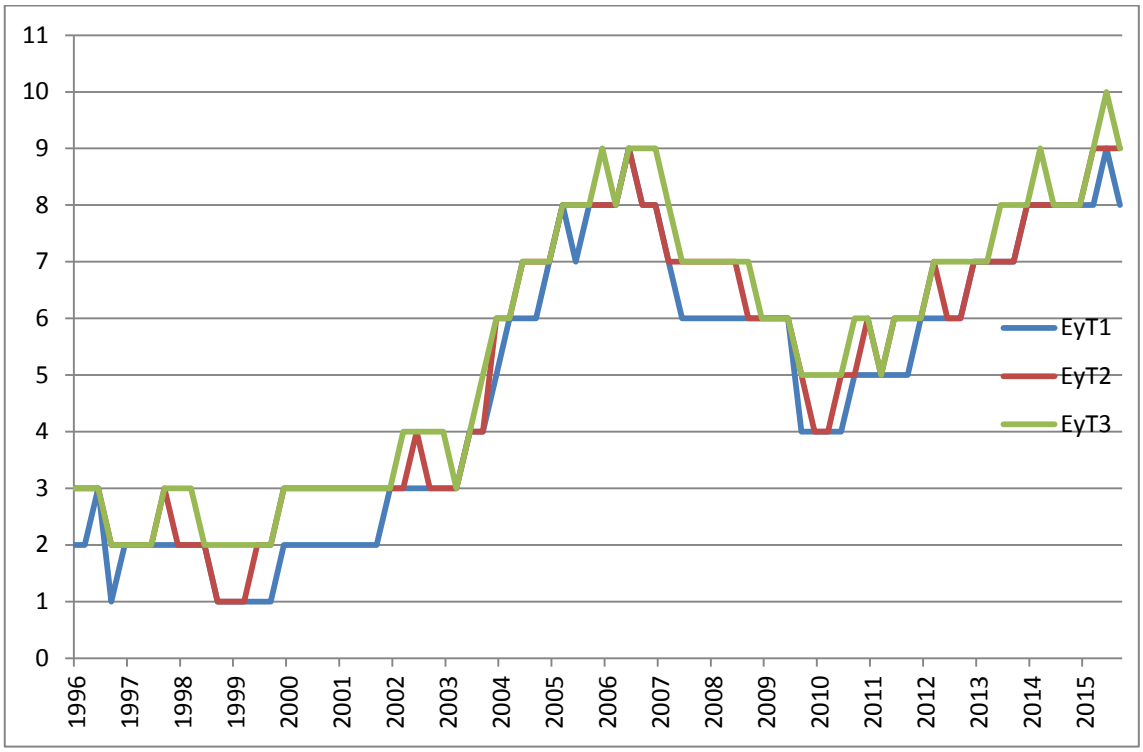

Figure 34: Number of Constituents per Portfolio (tercile) for Dividend Yield

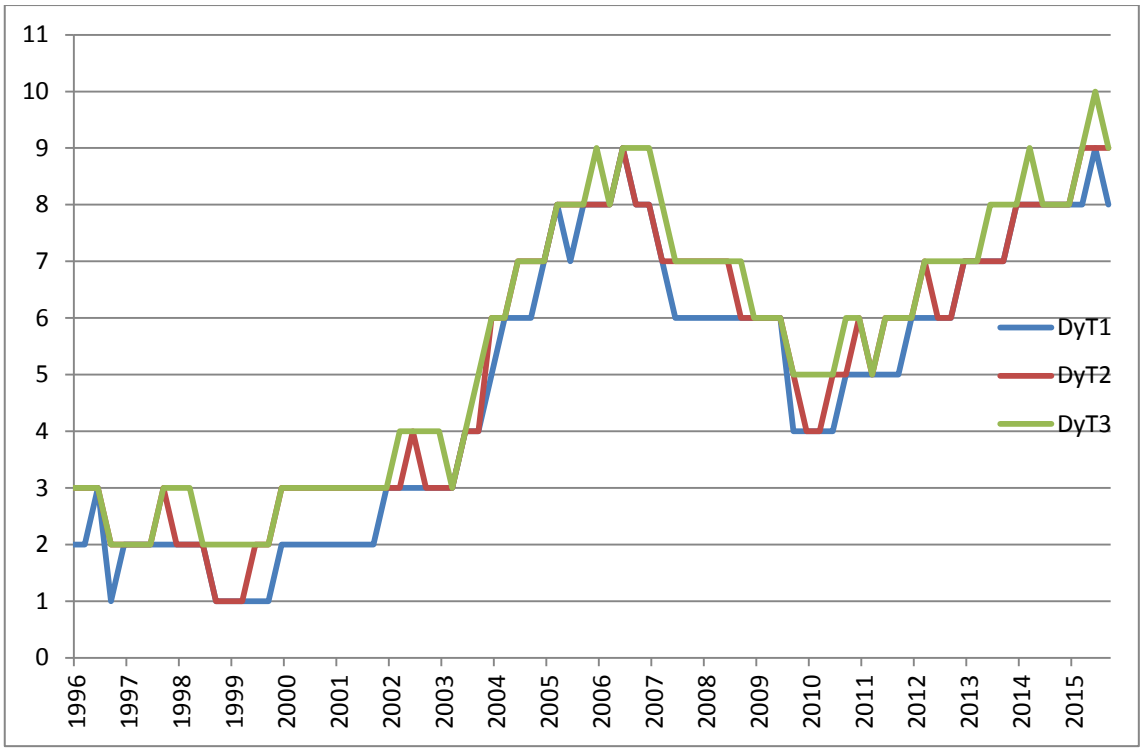

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Figure 35: Number of Constituents per Portfolio (tercile) for Dividend Growth

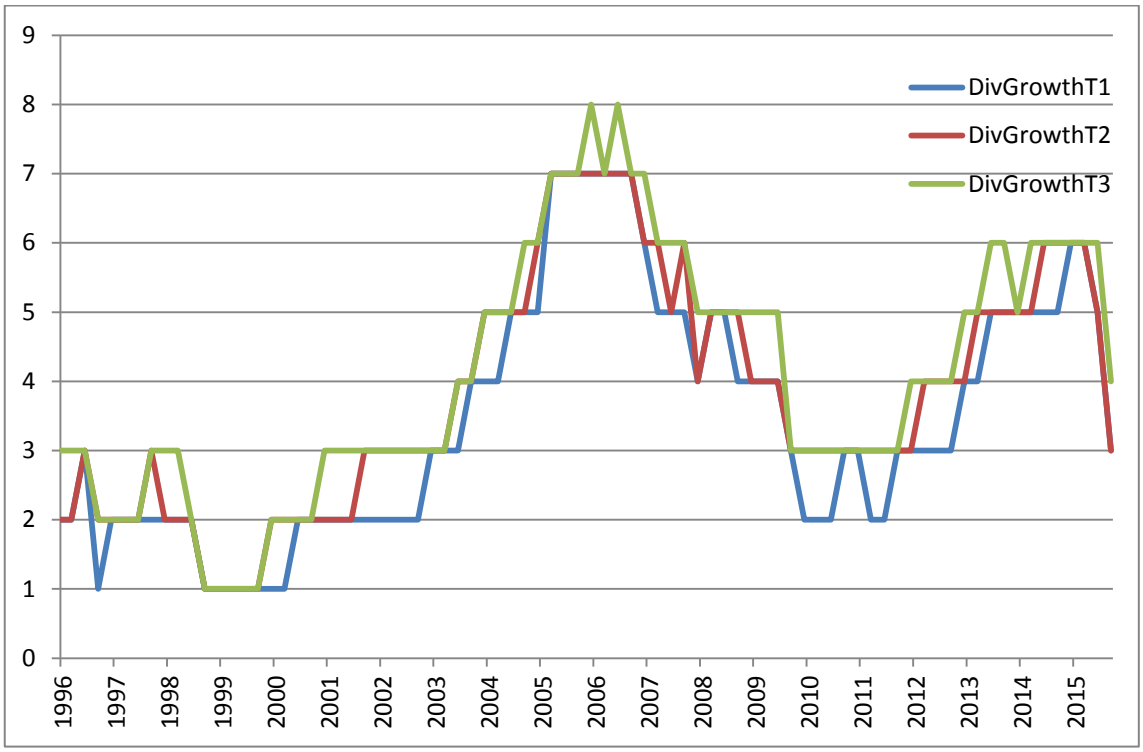

Figure 36: Number of Constituents per Portfolio (tercile) for Price to NAV

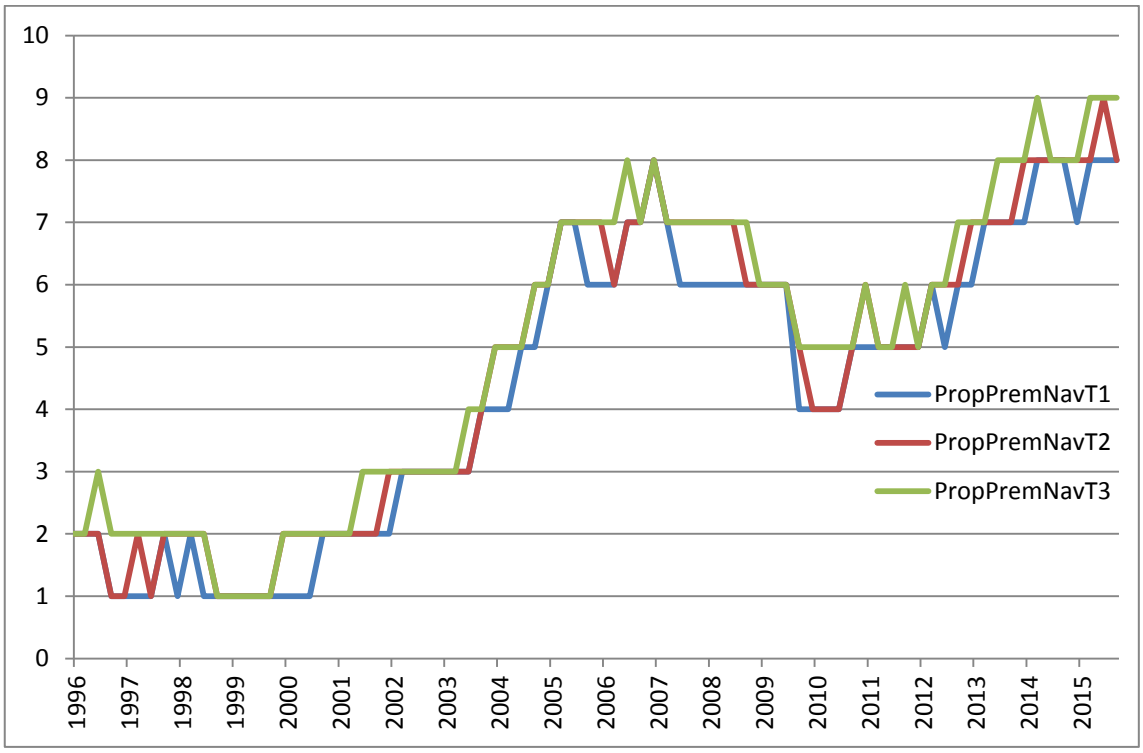

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Figure 37: Number of Constituents per Portfolio (tercile) for Loan to Value

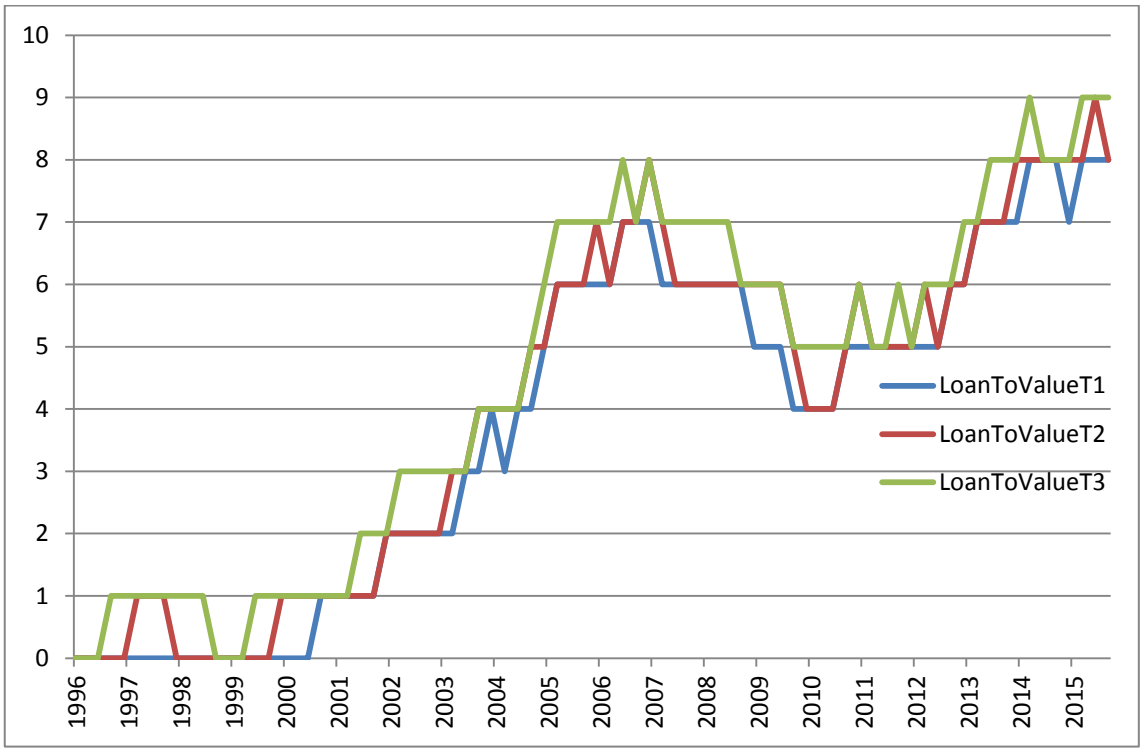

Figure 38: Number of Constituents per Portfolio (tercile) for Interest Cover Ratio

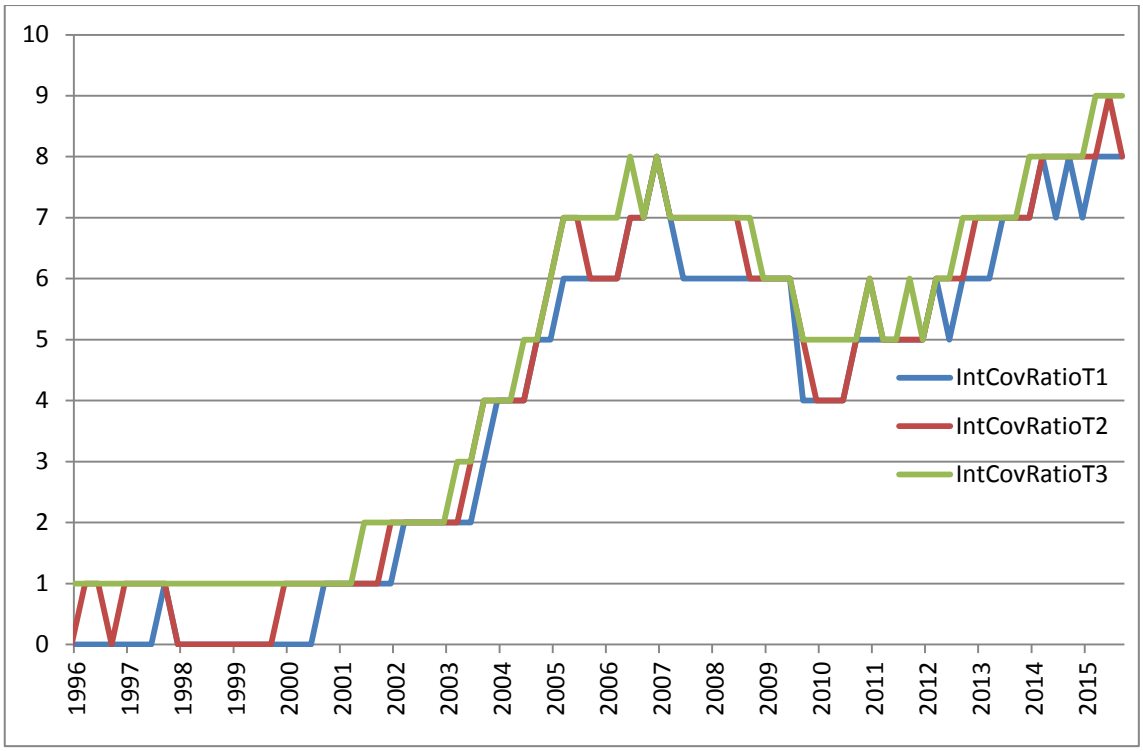

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Figure 39: Number of Constituents per Portfolio (tercile) for Average Cost of Debt

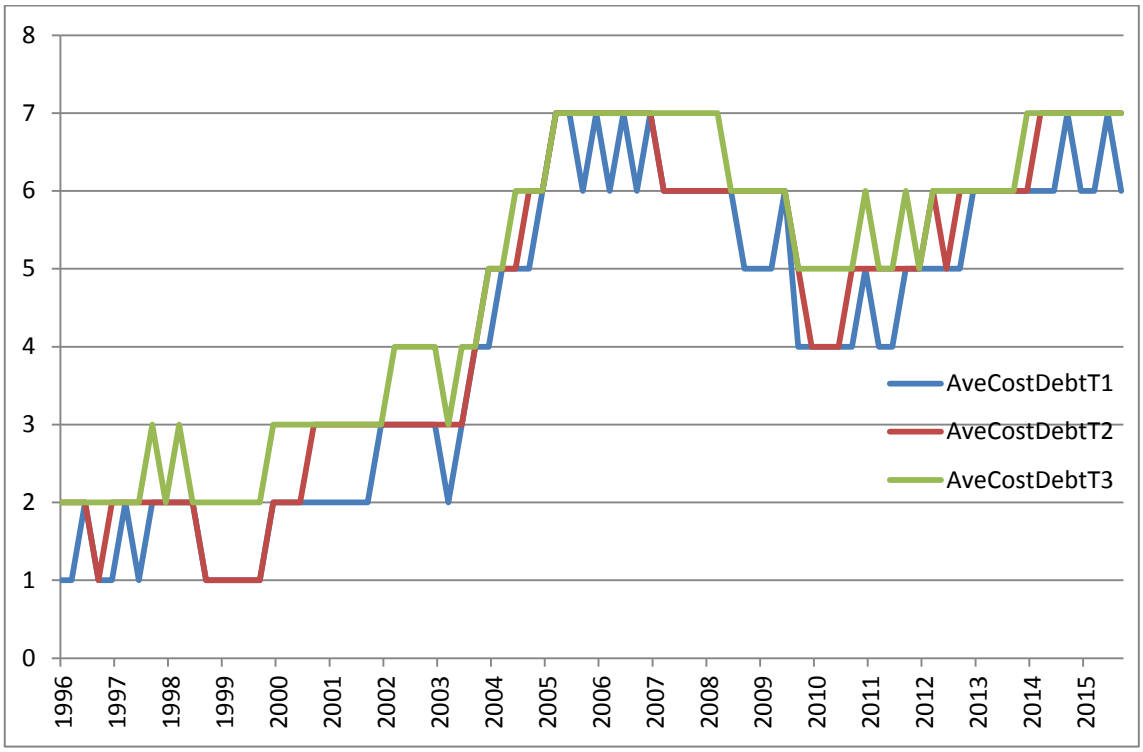

Figure 40: Number of Constituents per Portfolio (tercile) for Total Geographic Concentration

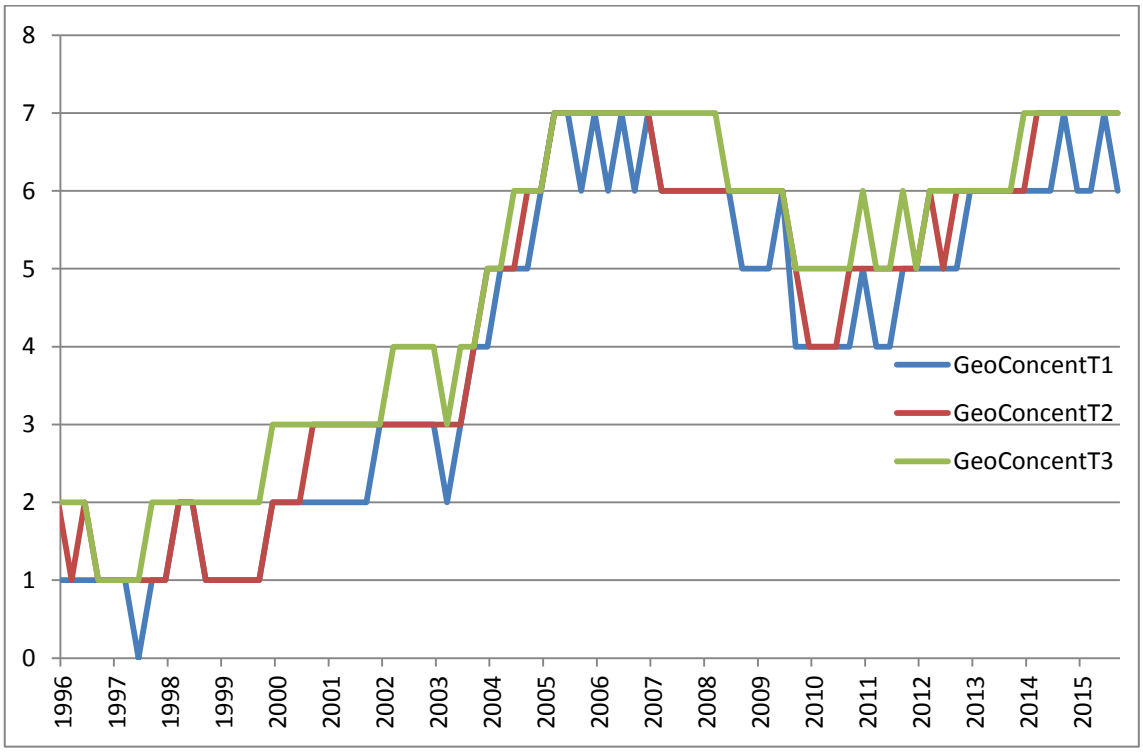

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Figure 41: Number of Constituents per Portfolio (tercile) for Geographic: Gauteng Percentage

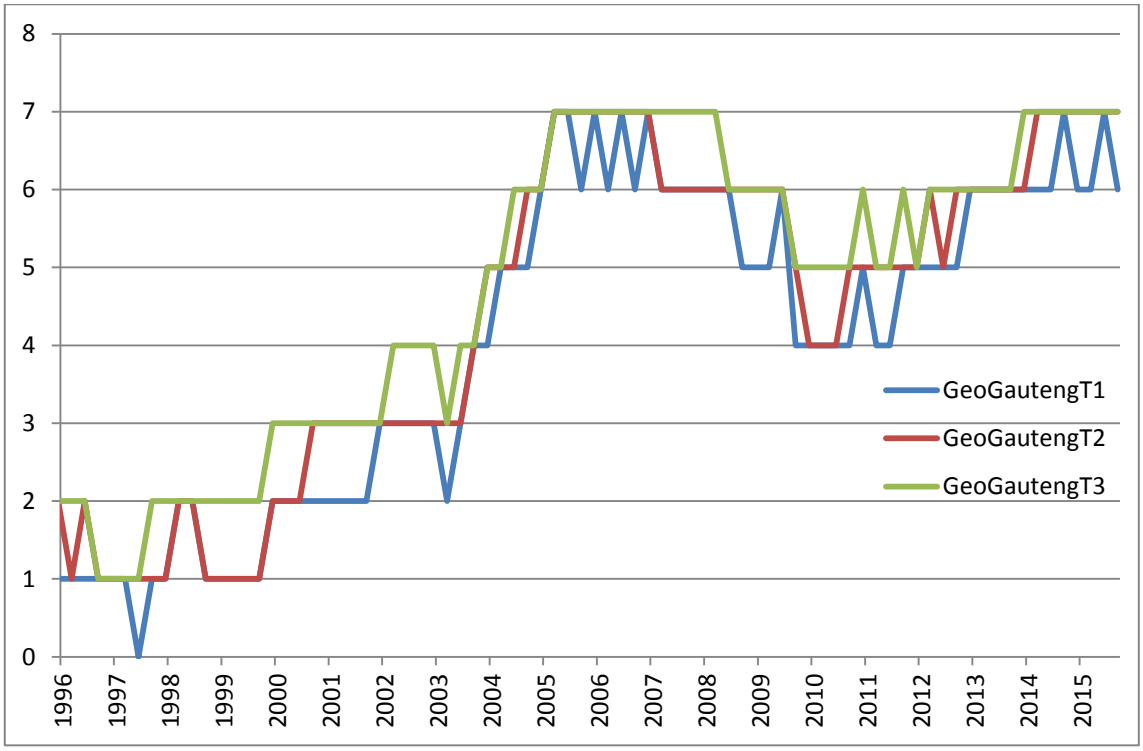

Figure 42: Number of Constituents per Portfolio (tercile) for Geographic: Western Cape Percentage

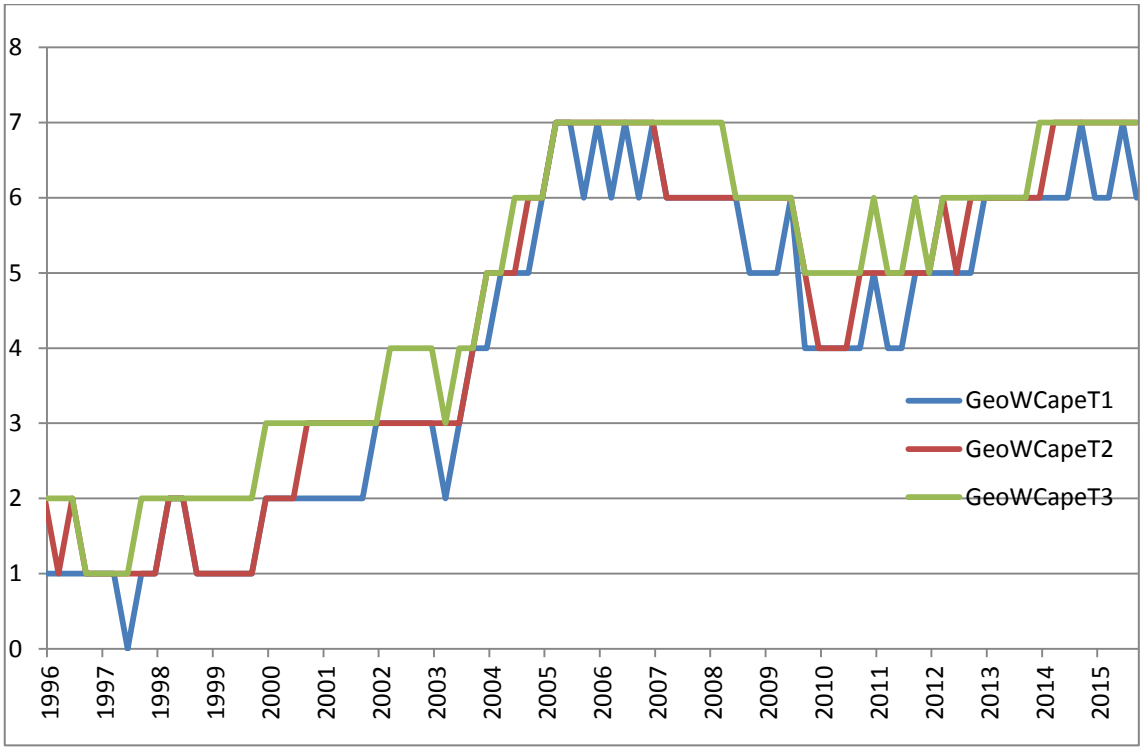

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Figure 43: Number of Constituents per Portfolio (tercile) for Geographic: South Africa Other Percentage

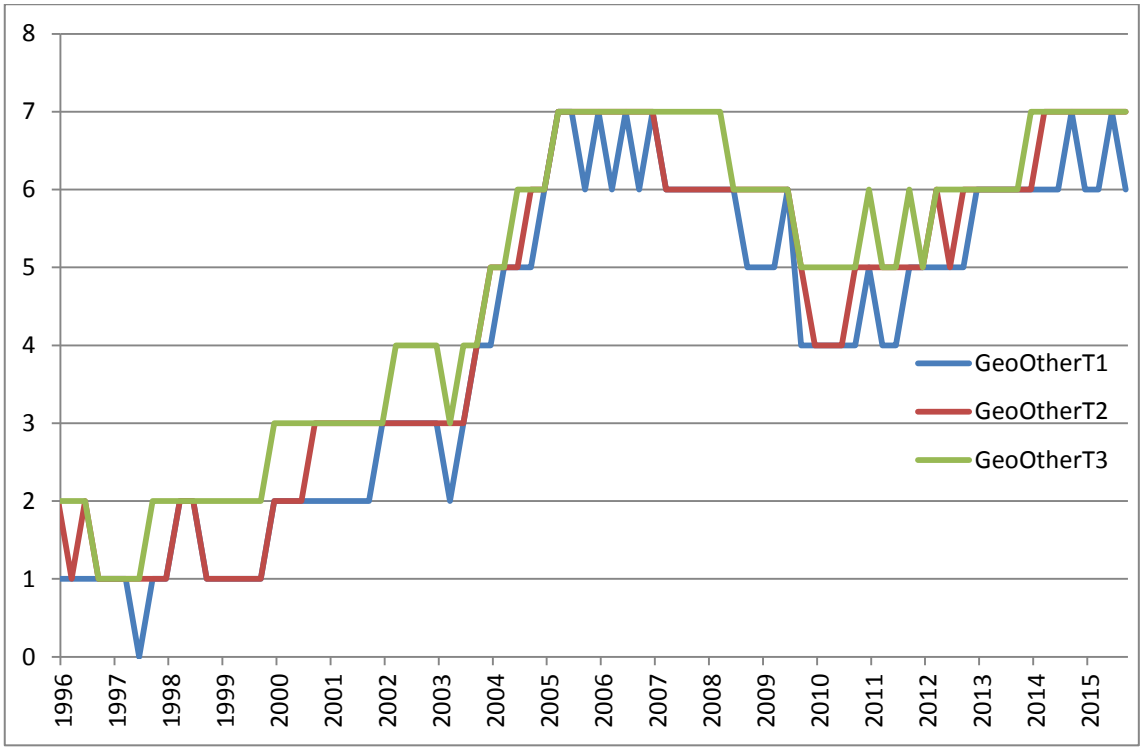

Figure 44: Number of Constituents per Portfolio (tercile) for Geographic: International Percentage

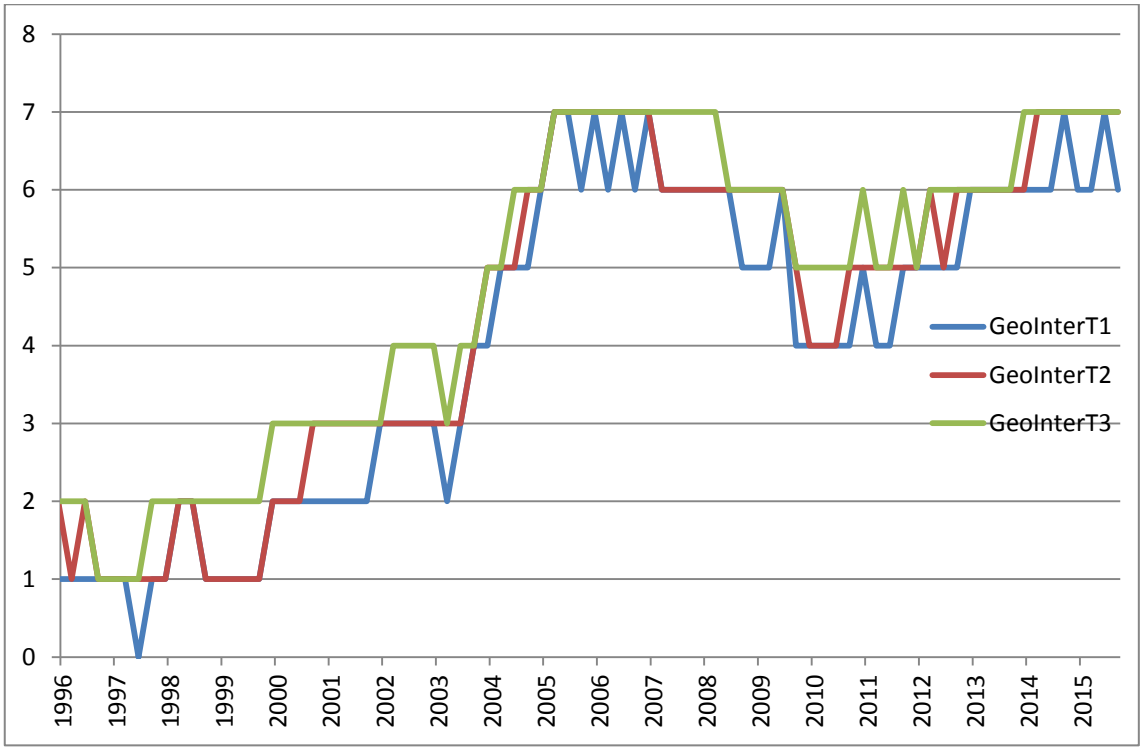

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Figure 45: Number of Constituents per Portfolio (tercile) for Total Sector Concentration

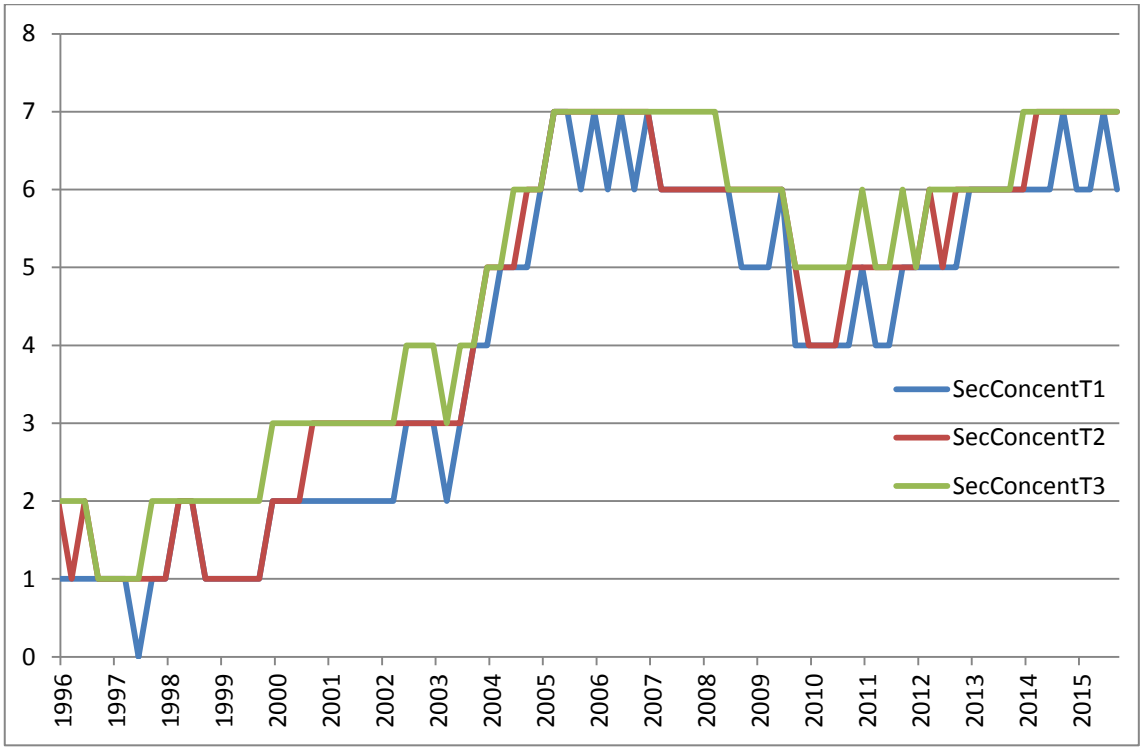

Figure 46: Number of Constituents per Portfolio (tercile) for Sector: Office Percentage

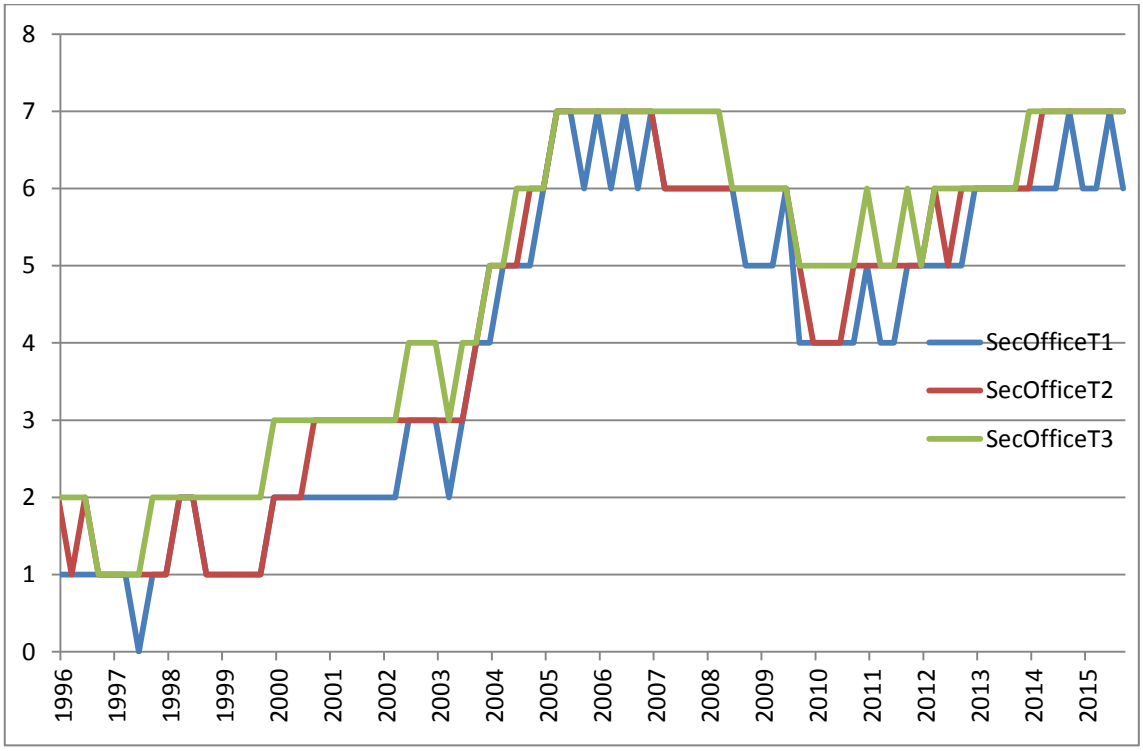

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Figure 47: Number of Constituents per Portfolio (tercile) for Sector: Retail Percentage

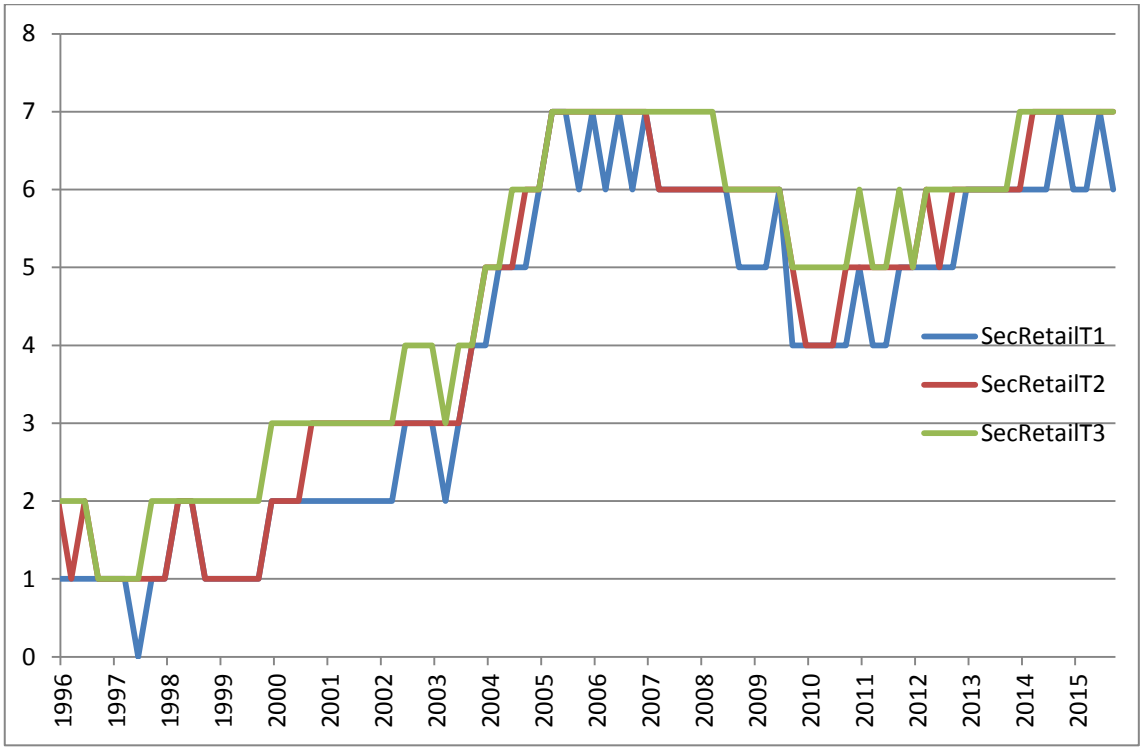

Figure 48: Number of Constituents per Portfolio (tercile) for Sector: Industrial Percentage

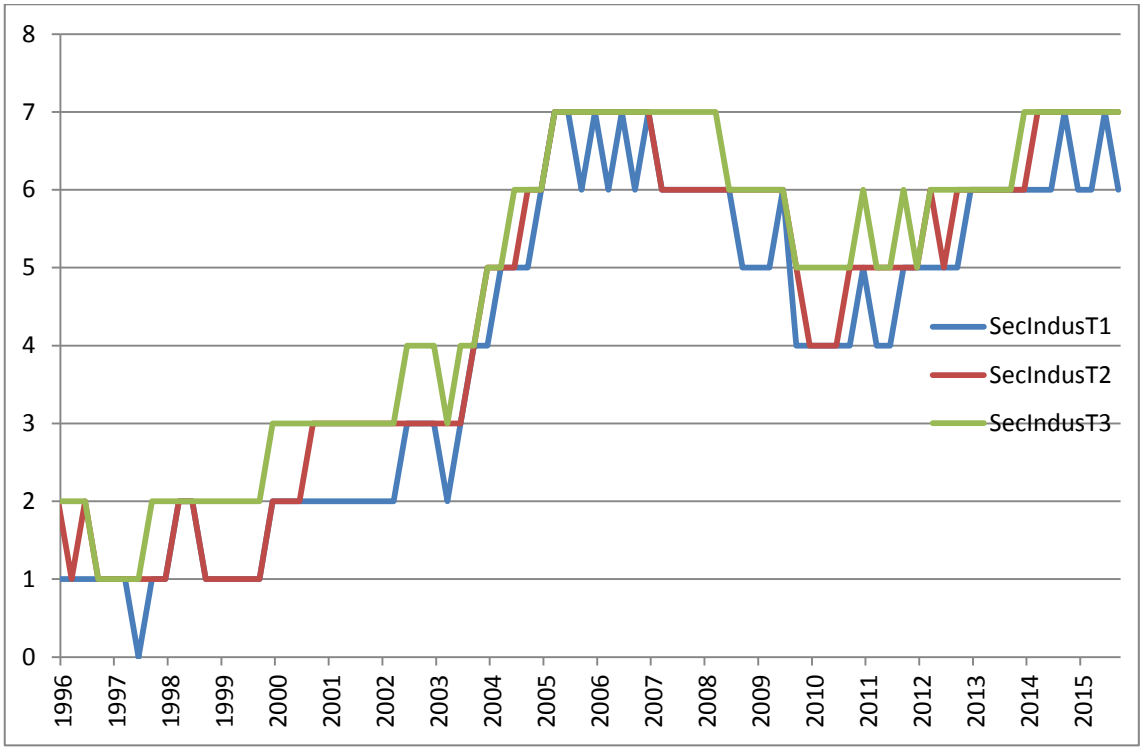

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Figure 49: Number of Constituents per Portfolio (tercile) for Sector: Other Percentage

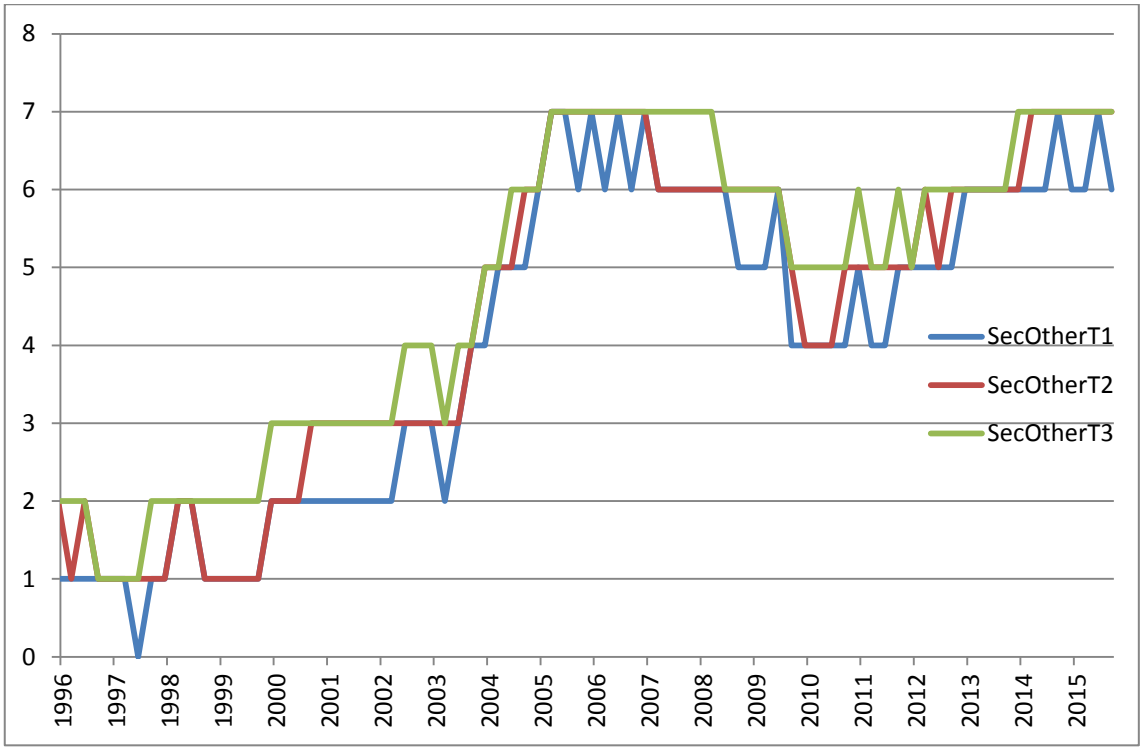
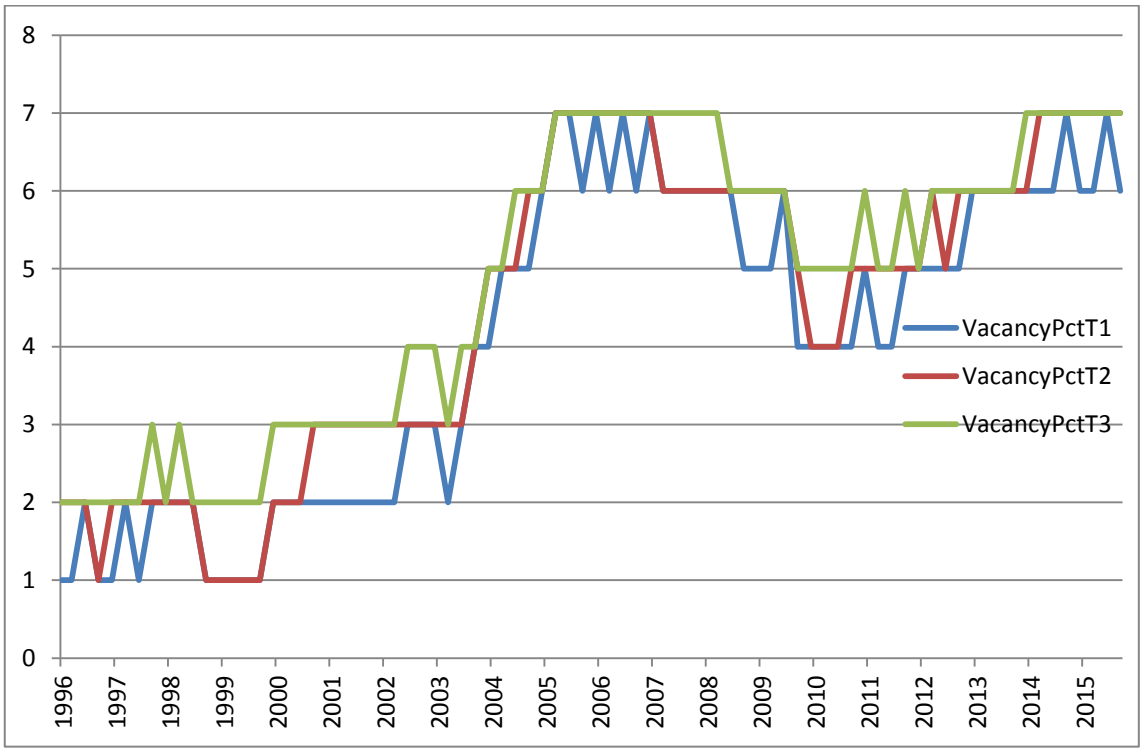


Figure 50: Number of Constituents per Portfolio (tercile) for Vacancy Percentage



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APPENDIX B: Descriptive Statistics for Style Portfolios

Table 57: Descriptive Statistics of lognormal returns data for Momentum

	MomentumT1	MomentumT2	MomentumT3	All160
Mean	1.04%	1.84%	1.66%	1.16%
Standard Error	0.003311549	0.00344746	0.003529827	0.003123077
Median	1.53%	1.93%	1.64%	1.51%
Mode	#N/A	0.09531018	#N/A	#N/A
Standard Deviation	0.05130229	0.053407818	0.054683842	0.048382506
Sample Variance	0.002631925	0.002852395	0.002990323	0.002340867
Kurtosis	1.245157044	**3.895226134**	2.355307561	**8.564104695**
Skewness	-0.605942891	0.321981284	0.331640182	**-1.447223343**
Range	33.17%	46.18%	43.15%	46.57%
Minimum	-18.95%	-17.42%	-17.66%	-31.75%
Maximum	14.22%	28.77%	25.49%	14.81%
Sum	2.506498997	4.408506358	3.977743729	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.65%	0.68%	0.70%	0.62%

Table 58: Descriptive Statistics of lognormal returns data for Size

	SizeT1	SizeT2	SizeT3	All160
Mean	1.45%	1.42%	1.85%	1.16%
Standard Error	0.0031074	0.003283688	0.003590288	0.003123077
Median	1.57%	1.50%	1.84%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.048139635	0.05087068	0.055620497	0.048382506
Sample Variance	0.002317424	0.002587826	0.00309364	0.002340867
Kurtosis	2.863223778	2.723317222	**3.599144556**	**8.564104695**
Skewness	0.209366088	0.108615845	0.094040209	**-1.447223343**
Range	38.22%	39.69%	49.02%	46.57%
Minimum	-12.73%	-16.37%	-18.94%	-31.75%
Maximum	25.49%	23.32%	30.08%	14.81%
Sum	3.471113145	3.398727175	4.446363301	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.61%	0.65%	0.71%	0.62%

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Table 59: Descriptive Statistics of lognormal returns data for Value Traded

	ValTrdT1	ValTrdT2	ValTrdT3	All160
Mean	1.46%	1.49%	1.69%	1.16%
Standard Error	0.003212157	0.003328186	0.00360523	0.003123077
Median	1.65%	2.08%	1.77%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.049762519	0.051560036	0.05585198	0.048382506
Sample Variance	0.002476308	0.002658437	0.003119444	0.002340867
Kurtosis	**3.440117715**	1.500198755	1.638411872	**8.564104695**
Skewness	0.44730551	-0.459421645	-0.026713669	**-1.447223343**
Range	38.37%	34.33%	38.07%	46.57%
Minimum	-12.88%	-16.10%	-17.33%	-31.75%
Maximum	25.49%	18.22%	20.75%	14.81%
Sum	3.505354931	3.579772659	4.056748046	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.63%	0.66%	0.71%	0.62%

Table 60: Descriptive Statistics of lognormal returns data for Value Traded percentage of Market Capitalisation

	ValTrMktCapT1	ValTrMktCapT2	ValTrMktCapT3	All160
Mean	1.53%	1.74%	1.48%	1.16%
Standard Error	0.003979562	0.003079424	0.003057528	0.003123077
Median	1.39%	1.89%	1.39%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.061651115	0.04770623	0.047367015	0.048382506
Sample Variance	0.00380086	0.002275884	0.002243634	0.002340867
Kurtosis	**3.56066039**	1.501517829	1.403628984	**8.564104695**
Skewness	0.257568936	-0.030801799	0.015294079	**-1.447223343**
Range	49.29%	34.89%	32.50%	46.57%
Minimum	-20.52%	-15.70%	-13.37%	-31.75%
Maximum	28.77%	19.18%	19.13%	14.81%
Sum	3.67482234	4.180021019	3.562997139	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.78%	0.61%	0.60%	0.62%

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Table 61: Descriptive Statistics of lognormal returns data for Earnings Yield

	EyT1	EyT2	EyT3	All160
Mean	1.73%	1.66%	1.37%	1.16%
Standard Error	0.003649252	0.003408376	0.003130015	0.003123077
Median	2.10%	1.49%	1.34%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.056533976	0.052802338	0.048489991	0.048382506
Sample Variance	0.00319609	0.002788087	0.002351279	0.002340867
Kurtosis	**3.244275408**	1.179595348	2.375354507	**8.564104695**
Skewness	0.275514168	-0.226628495	0.073593185	**-1.447223343**
Range	47.98%	33.87%	36.22%	46.57%
Minimum	-17.66%	-15.73%	-17.09%	-31.75%
Maximum	30.32%	18.13%	19.13%	14.81%
Sum	4.141099816	3.985014901	3.298375032	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.72%	0.67%	0.62%	0.62%

Table 62: Descriptive Statistics of lognormal returns data for Dividend Yield

	DyT1	DyT2	DyT3	All160
Mean	1.73%	1.54%	1.48%	1.16%
Standard Error	0.00364401	0.003346247	0.003188264	0.003123077
Median	2.28%	1.31%	1.58%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.056452759	0.051839841	0.049392373	0.048382506
Sample Variance	0.003186914	0.002687369	0.002439607	0.002340867
Kurtosis	**3.074109984**	1.322926262	2.082805716	**8.564104695**
Skewness	0.307058666	-0.18772586	-0.028181697	**-1.447223343**
Range	44.76%	35.48%	36.22%	46.57%
Minimum	-14.44%	-17.35%	-17.09%	-31.75%
Maximum	30.32%	18.13%	19.13%	14.81%
Sum	4.158441017	3.69484416	3.543786223	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.72%	0.66%	0.63%	0.62%

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Table 63: Descriptive Statistics of lognormal returns data for Dividend Growth

	DivGrowthT1	DivGrowthT2	DivGrowthT3	All160
Mean	1.41%	1.65%	1.42%	1.16%
Standard Error	0.003560571	0.003234253	0.003357453	0.003123077
Median	1.97%	1.58%	1.17%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.055160127	0.050104838	0.052013437	0.048382506
Sample Variance	0.00304264	0.002510495	0.002705398	0.002340867
Kurtosis	**3.814367257**	1.368883098	2.314624496	**8.564104695**
Skewness	-0.173018152	0.021010909	0.403736679	**-1.447223343**
Range	49.29%	36.08%	40.16%	46.57%
Minimum	-20.52%	-13.76%	-14.67%	-31.75%
Maximum	28.77%	22.31%	25.49%	14.81%
Sum	3.395970111	3.951673687	3.410561951	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.70%	0.64%	0.66%	0.62%

Table 64: Descriptive Statistics of lognormal returns data for Price to NAV

	PropPremNav T1	PropPremNav T2	PropPremNav T3	All160
Mean	1.59%	1.67%	1.85%	1.16%
Standard Error	0.003231727	0.003562903	0.003742959	0.003123077
Median	1.58%	2.11%	2.19%	1.51%
Mode	0	0	#N/A	#N/A
Standard Deviation	0.050065697	0.055196263	0.057985668	0.048382506
Sample Variance	0.002506574	0.003046627	0.003362338	0.002340867
Kurtosis	**6.438392523**	2.645269349	**3.747393851**	**8.564104695**
Skewness	0.005357147	0.002046761	0.396857018	**-1.447223343**
Range	54.30%	43.17%	48.17%	46.57%
Minimum	-25.53%	-17.68%	-17.86%	-31.75%
Maximum	28.77%	25.49%	30.32%	14.81%
Sum	3.819439985	3.999834446	4.445991423	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.64%	0.70%	0.74%	0.62%

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Table 65: Descriptive Statistics of lognormal returns data for Loan to Value

	LoanToValue T1	LoanToValue T2	LoanToValue T3	All160
Mean	1.57%	1.94%	1.78%	1.25%
Standard Error	0.003092052	0.003340848	0.00334478	0.002882004
Median	1.28%	2.53%	2.09%	1.56%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.042844734	0.046292153	0.046346635	0.039934219
Sample Variance	0.001835671	0.002142963	0.002148011	0.001594742
Kurtosis	0.415318435	1.563680324	1.21731476	0.719448351
Skewness	-0.028099749	-0.44678928	-0.256550162	-0.600793791
Range	24.89%	31.59%	32.07%	23.55%
Minimum	-10.74%	-15.61%	-14.56%	-13.74%
Maximum	14.16%	15.99%	17.51%	9.82%
Sum	3.01955066	3.728573561	3.41988618	2.39340443
Count	192	192	192	192
Confidence Level (95.0%)	0.61%	0.66%	0.66%	0.57%

Table 66: Descriptive Statistics of lognormal returns data for Interest Cover Ratio

	IntCovRatioT1	IntCovRatioT2	IntCovRatioT3	All160
Mean	1.71%	1.91%	1.83%	1.25%
Standard Error	0.003342573	0.003478254	0.00316093	0.002882004
Median	1.39%	2.41%	1.76%	1.56%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.046316047	0.048196097	0.043799132	0.039934219
Sample Variance	0.002145176	0.002322864	0.001918364	0.001594742
Kurtosis	1.733372034	1.301495045	0.444982169	0.719448351
Skewness	-0.092523256	-0.442707791	-0.104143031	-0.600793791
Range	32.56%	32.16%	25.07%	23.55%
Minimum	-14.55%	-15.85%	-11.06%	-13.74%
Maximum	18.01%	16.31%	14.01%	9.82%
Sum	3.280826982	3.672712059	3.520184331	2.39340443
Count	192	192	192	192
Confidence Level (95.0%)	0.66%	0.69%	0.62%	0.57%

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Table 67: Descriptive Statistics of lognormal returns data for Average Cost of Debt

	AveCostDebt T1	AveCostDebt T2	AveCostDebt T3	All160
Mean	1.63%	1.64%	1.49%	1.16%
Standard Error	0.003843475	0.00367925	0.002856481	0.003123077
Median	1.71%	1.57%	1.64%	1.51%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.059542862	0.056998697	0.044252416	0.048382506
Sample Variance	0.003545352	0.003248852	0.001958276	0.002340867
Kurtosis	**4.762810215**	**3.50904726**	0.937222317	**8.564104695**
Skewness	0.13854818	0.303719798	-0.353955097	**-1.447223343**
Range	57.54%	44.70%	29.65%	46.57%
Minimum	-27.22%	-15.93%	-14.15%	-31.75%
Maximum	30.32%	28.77%	15.50%	14.81%
Sum	3.910057708	3.927151036	3.584118144	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.76%	0.72%	0.56%	0.62%

Table 68: Descriptive Statistics of lognormal returns data for Total Geographic Concentration

	GeoConcent T1	GeoConcent T2	GeoConcent T3	All160
Mean	1.93%	1.33%	1.48%	1.16%
Standard Error	0.003273919	0.003870081	0.003312356	0.003123077
Median	2.03%	1.44%	1.89%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.050719328	0.059955036	0.051314795	0.048382506
Sample Variance	0.00257245	0.003594606	0.002633208	0.002340867
Kurtosis	**5.771536176**	2.701205089	0.934731009	**8.564104695**
Skewness	**0.873476109**	-0.040670773	-0.001092452	**-1.447223343**
Range	43.69%	46.97%	31.11%	46.57%
Minimum	-13.37%	-21.48%	-12.88%	-31.75%
Maximum	30.32%	25.49%	18.22%	14.81%
Sum	4.631943392	3.182347492	3.553398229	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.64%	0.76%	0.65%	0.62%

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Table 69: Descriptive Statistics of lognormal returns data for Geographic: Gauteng Percentage

	GeoGauteng T1	GeoGauteng T2	GeoGauteng T3	All160
Mean	1.46%	1.53%	1.71%	1.16%
Standard Error	0.00425513	0.003221587	0.003025766	0.003123077
Median	1.46%	1.83%	1.55%	1.51%
Mode	#N/A	0	#N/A	#N/A
Standard Deviation	0.065920187	0.049908607	0.046874965	0.048382506
Sample Variance	0.004345471	0.002490869	0.002197262	0.002340867
Kurtosis	**3.431088755**	1.06115776	1.525559031	**8.564104695**
Skewness	0.411593876	-0.259757551	0.074182396	**-1.447223343**
Range	51.80%	34.56%	33.77%	46.57%
Minimum	-21.48%	-16.48%	-15.54%	-31.75%
Maximum	30.32%	18.09%	18.22%	14.81%
Sum	3.50202408	3.677416363	4.110298196	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.84%	0.63%	0.60%	0.62%

Table 70: Descriptive Statistics of lognormal returns data for Geographic: Western Cape Percentage

	GeoWCapeT1	GeoWCapeT2	GeoWCapeT3	All160
Mean	1.54%	1.26%	1.84%	1.16%
Standard Error	0.003746781	0.00356299	0.003125596	0.003123077
Median	1.55%	1.59%	1.88%	1.51%
Mode	0	0	#N/A	#N/A
Standard Deviation	0.058044885	0.055197601	0.048421523	0.048382506
Sample Variance	0.003369209	0.003046775	0.002344644	0.002340867
Kurtosis	2.647440615	2.162413574	2.31765579	**8.564104695**
Skewness	0.526491988	-0.113504467	0.195742415	**-1.447223343**
Range	41.86%	41.74%	33.33%	46.57%
Minimum	-13.09%	-16.25%	-14.15%	-31.75%
Maximum	28.77%	25.49%	19.18%	14.81%
Sum	3.702719356	3.031192336	4.418820766	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.74%	0.70%	0.62%	0.62%

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Table 71: Descriptive Statistics of lognormal returns data for Geographic: South Africa Other Percentage

	GeoOtherT1	GeoOtherT2	GeoOtherT3	All160
Mean	1.57%	1.67%	1.54%	1.16%
Standard Error	0.003640751	0.00389793	0.003058107	0.003123077
Median	1.63%	1.80%	2.08%	1.51%
Mode	0	0	#N/A	#N/A
Standard Deviation	0.056402272	0.060386475	0.047375996	0.048382506
Sample Variance	0.003181216	0.003646526	0.002244485	0.002340867
Kurtosis	**3.527929811**	**3.302745829**	1.47935242	**8.564104695**
Skewness	0.397511812	0.609113128	-0.210932736	**-1.447223343**
Range	45.14%	46.57%	30.84%	46.57%
Minimum	-16.37%	-16.25%	-12.88%	-31.75%
Maximum	28.77%	30.32%	17.96%	14.81%
Sum	3.766211572	4.003702369	3.689913884	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.72%	0.77%	0.60%	0.62%

Table 72: Descriptive Statistics of lognormal returns data for Geographic: International Percentage

	GeoInterT1	GeoInterT2	GeoInterT3	All160
Mean	1.88%	1.46%	1.46%	1.16%
Standard Error	0.003613981	0.003555887	0.003615217	0.003123077
Median	1.91%	1.52%	1.69%	1.51%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.055987558	0.055087567	0.056006709	0.048382506
Sample Variance	0.003134607	0.00303464	0.003136751	0.002340867
Kurtosis	**5.325485003**	**4.278760544**	1.873022341	**8.564104695**
Skewness	0.530846685	0.777276829	-0.14379556	**-1.447223343**
Range	50.25%	45.99%	41.74%	46.57%
Minimum	-21.48%	-15.67%	-16.25%	-31.75%
Maximum	28.77%	30.32%	25.49%	14.81%
Sum	4.50687436	3.510947481	3.515997792	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.71%	0.70%	0.71%	0.62%

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Table 73: Descriptive Statistics of lognormal returns data for Total Sector Concentration

	SecConcent T1	SecConcent T2	SecConcent T3	All160
Mean	1.52%	1.82%	1.37%	1.16%
Standard Error	0.003962698	0.003396574	0.003335323	0.003123077
Median	1.55%	1.94%	1.73%	1.51%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.061389853	0.052619505	0.051670598	0.048382506
Sample Variance	0.003768714	0.002768812	0.002669851	0.002340867
Kurtosis	**4.761857085**	**3.615968235**	1.136997299	**8.564104695**
Skewness	0.579262305	0.568512122	-0.066956211	**-1.447223343**
Range	51.80%	42.07%	35.18%	46.57%
Minimum	-21.48%	-13.30%	-16.92%	-31.75%
Maximum	30.32%	28.77%	18.26%	14.81%
Sum	3.653981673	4.367988463	3.296646306	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.78%	0.67%	0.66%	0.62%

Table 74: Descriptive Statistics of lognormal returns data for Sector: Office Percentage

	SecOfficeT1	SecOfficeT2	SecOfficeT3	All160
Mean	1.52%	1.57%	1.56%	1.16%
Standard Error	0.004039901	0.003185856	0.003178548	0.003123077
Median	1.77%	1.81%	1.62%	1.51%
Mode	0	-2.22045E-16	#N/A	#N/A
Standard Deviation	0.062585871	0.049355076	0.04924185	0.048382506
Sample Variance	0.003916991	0.002435923	0.00242476	0.002340867
Kurtosis	**3.678615368**	0.917099638	1.495652753	**8.564104695**
Skewness	0.446427287	-0.438540239	0.279325826	**-1.447223343**
Range	50.25%	30.42%	31.66%	46.57%
Minimum	-21.48%	-14.53%	-12.28%	-31.75%
Maximum	28.77%	15.89%	19.38%	14.81%
Sum	3.640888238	3.77903116	3.735417005	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.80%	0.63%	0.63%	0.62%

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Table 75: Descriptive Statistics of lognormal returns data for Sector: Retail Percentage

	SecRetailT1	SecRetailT2	SecRetailT3	All160
Mean	1.18%	2.00%	1.46%	1.16%
Standard Error	0.00323177	0.003791445	0.003410119	0.003123077
Median	1.42%	1.92%	1.68%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.050066364	0.058736819	0.052829334	0.048382506
Sample Variance	0.002506641	0.003450014	0.002790938	0.002340867
Kurtosis	2.19182241	**3.41497866**	1.673293043	**8.564104695**
Skewness	0.114660681	0.372235375	0.177566212	**-1.447223343**
Range	38.37%	45.02%	33.71%	46.57%
Minimum	-12.88%	-16.25%	-14.53%	-31.75%
Maximum	25.49%	28.77%	19.18%	14.81%
Sum	2.829876123	4.800032729	3.505793311	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.64%	0.75%	0.67%	0.62%

Table 76: Descriptive Statistics of lognormal returns data for Sector: Industrial Percentage

	SecIndusT1	SecIndusT2	SecIndusT3	All160
Mean	1.51%	1.69%	1.47%	1.16%
Standard Error	0.003621778	0.003194626	0.003412962	0.003123077
Median	1.64%	1.94%	1.53%	1.51%
Mode	0	#N/A	#N/A	#N/A
Standard Deviation	0.056108347	0.049490939	0.052873374	0.048382506
Sample Variance	0.003148147	0.002449353	0.002795594	0.002340867
Kurtosis	**3.958443731**	0.944673826	2.897839557	**8.564104695**
Skewness	0.787145356	-0.171823924	0.173330637	**-1.447223343**
Range	44.84%	34.26%	41.74%	46.57%
Minimum	-14.53%	-17.09%	-16.25%	-31.75%
Maximum	30.32%	17.17%	25.49%	14.81%
Sum	3.619106342	4.056905948	3.526295495	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.71%	0.63%	0.67%	0.62%

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Table 77: Descriptive Statistics of lognormal returns data for Sector: Other Percentage

	SecOtherT1	SecOtherT2	SecOtherT3	All160
Mean	1.59%	1.35%	1.71%	1.16%
Standard Error	0.003409586	0.003915905	0.003188924	0.003123077
Median	1.50%	1.82%	1.94%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.052821083	0.060664936	0.049402595	0.048382506
Sample Variance	0.002790067	0.003680234	0.002440616	0.002340867
Kurtosis	**3.116615302**	**3.630511019**	1.831543716	**8.564104695**
Skewness	0.354012837	0.300902968	-0.003419536	**-1.447223343**
Range	44.76%	46.97%	34.73%	46.57%
Minimum	-15.99%	-21.48%	-15.54%	-31.75%
Maximum	28.77%	25.49%	19.18%	14.81%
Sum	3.812791587	3.232109921	4.111263939	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.67%	0.77%	0.63%	0.62%

Table 78: Descriptive Statistics of lognormal returns data for Vacancy Percentage of Portfolio

	VacancyPctT1	VacancyPctT2	VacancyPctT3	All160
Mean	1.35%	1.52%	1.72%	1.16%
Standard Error	0.00368587	0.003588246	0.003004014	0.003123077
Median	1.55%	1.78%	1.86%	1.51%
Mode	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.057101254	0.05558887	0.04653799	0.048382506
Sample Variance	0.003260553	0.003090122	0.002165785	0.002340867
Kurtosis	2.076850704	**3.669763311**	1.669322797	**8.564104695**
Skewness	0.29732625	0.15433332	-0.000228665	**-1.447223343**
Range	43.35%	49.27%	33.67%	46.57%
Minimum	-17.86%	-18.95%	-15.44%	-31.75%
Maximum	25.49%	30.32%	18.22%	14.81%
Sum	3.23483513	3.640193027	4.121350689	2.7724889
Count	240	240	240	240
Confidence Level (95.0%)	0.73%	0.71%	0.59%	0.62%

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APPENDIX C: Graphical Time Series of Style with poor Data

Figure 51: Graphical Time Series of Style: Loan to Value (with poor Data from 1995)

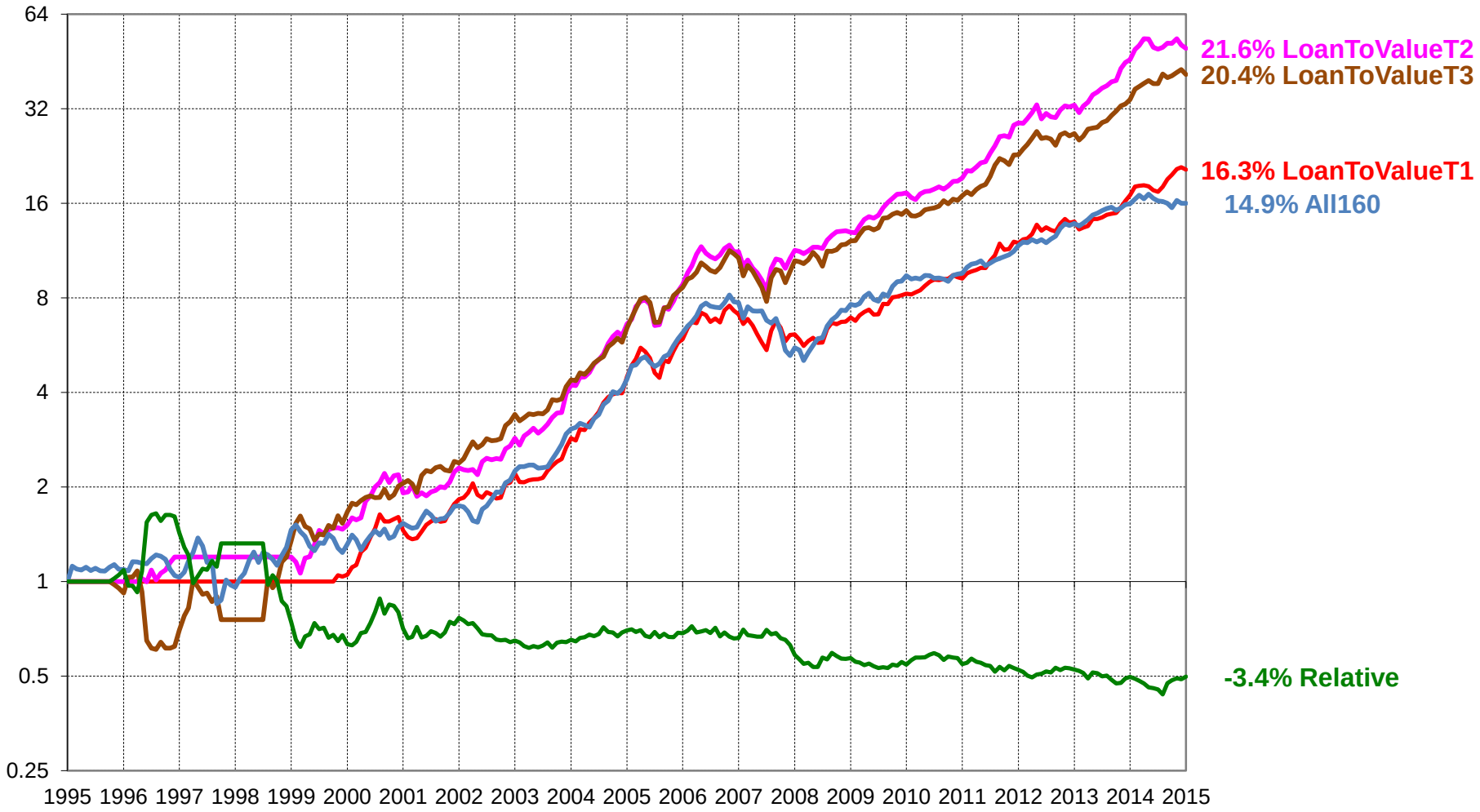

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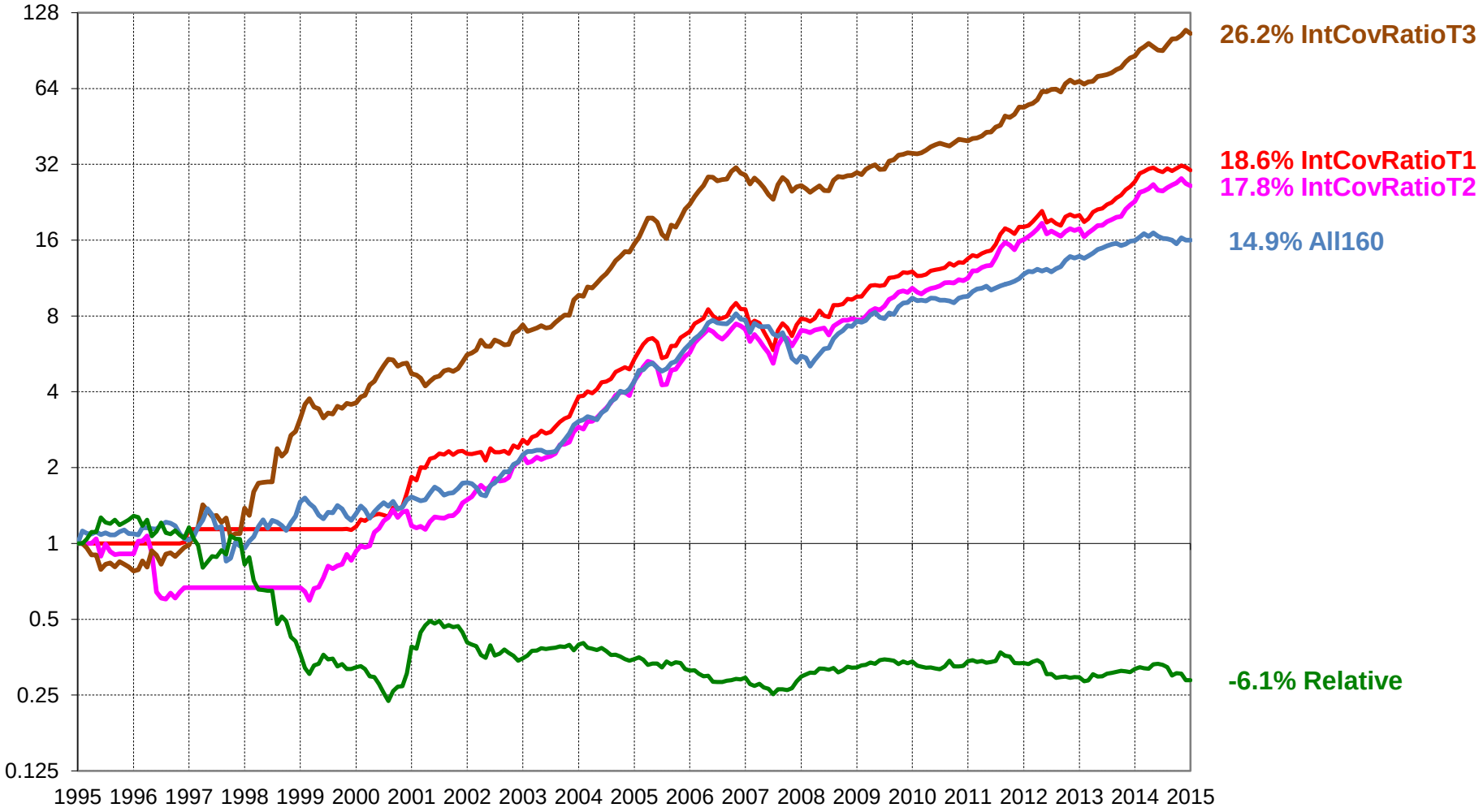
Figure 52: Graphical Time Series of Style: Interest Cover Ratio (with poor Data from 1995)



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APPENDIX D: Ethical Clearance Letter

Gordon Institute of Business Science
University of Pretoria

Dear Maurice Shapiro

Protocol Number: **Temp2015-02300**

Title: **The effects of property specific style-based variables on the returns of South African listed property equities**

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

Adele Bekker

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