




## Evaluating the financial performance of listed REIT firms in South Africa: A 7-step DuPont model technique

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### Keywords:

7-Factor DuPont model

Financial data analysis

Panel data analysis

Real estate

REIT.

### JEL Classification:

G11; G23; G33; G31; M21; M40.

Received: 17 April 2023

Revised: 5 June 2023

Accepted: 25 August 2023

Published: 7 September 2023

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### Abstract

This research paper presents empirical information about the use of the 7-step DuPont model in the context of publicly traded Real Estate Investment Trust (REIT) firms operating in South Africa. The DuPont model is a crucial paradigm for performance analysis, however, scholars have given its numerous parts varying ratings. As a result, it is now very necessary to examine it. The Generalized Least Square models (fixed effect and random effect) are used to evaluate the financial performance in a DuPont model context. The empirical study uses panel data from six REIT companies that are publicly traded on the Johannesburg Stock Exchange and spans the years 2005 through 2021. The findings of the study suggest a strong positive relationship between return on sales and return on equity. Additionally, a correlation was found, indicating a negative association between various operational items and return on equity. However, a notable positive correlation is shown between total asset turnover and return on equity. Contrary to the aforementioned findings, the fixed charge ratio, tax return, equity multiplier, as well as sales and management expenses, all reported an insignificant association with return on equity. The study avows that the seven-step DuPont model is the most appropriate model for assessing performance as it better explains the performance of listed REIT companies in South Africa. It may be inferred that the seven-step DuPont model provides a more comprehensive explanation of parameters associated with firms.

**Funding:** This study received no specific financial support.

**Institutional Review Board Statement:** Not applicable.

**Transparency:** The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

**Data Availability Statement:** The corresponding author may provide study data upon reasonable request.

**Competing Interests:** The authors declare that they have no competing interests.

**Authors' Contributions:** All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

## 1. Introduction

Real Estate Investment Trusts (REITs) are collective investment products listed on a Stock Exchange, and their main line of work is the purchase, management, and sale of investment property (Parker, 2012). Real Estate Investment Trusts (REITs) have the option to focus on specific sectors, such as office, retail, or industrial properties, or they can adopt a diversified approach by investing in a variety of property sectors. REITs are one of the investment vehicles that have recently gained popularity in some parts of the world. Notably, America and Europe are expanding their footprints in other developing and emerging economies, including South Africa.

Publicly held REITs have enabled investors to own and trade shares of highly illiquid real estate assets without primarily purchasing the actual real estate (Alias & Soi Thos, 2011). Besides, firms operating within the REIT sector strive to optimize their business operations by allocating investments towards properties that generate substantial income. REIT firms also pursue attractive performance by increasing and stabilizing their financial performance for sustainable long-term investment returns (Hoesli & Oikarinen, 2012). Among other things, the real estate investment trust (REIT) industry is widely recognised for its appeal in terms of capital appreciation as well as its obligatory distribution of dividends.

However, the sector is stupendously affected by adverse market conditions, which could be detrimental to its operations as shocks in the general economy have a repercussion on the REIT sector. The impact of the COVID-19 pandemic on the leverage positions of REIT companies is a noteworthy observation, as it has led to a decrease in cash flows necessary for servicing their debts. (Akinsomi, 2021). However, it is mandatory for REIT firms across the globe to distribute a significant portion of their net income to investors in order to qualify for tax exemptions. Besides, this could reduce firms' retained earnings, consequently leading to an increased dependence on debt capital. Akinsomi (2021) shares the position that during the COVID-19 pandemic season, listed REITs and retail owners in South Africa provided up to 100% rental discounts and rental deferrals, with adverse consequences for the performances of residential REIT firms. On the flip side of the coin, the return on equity (ROE) is popularly used as one of the measures of financial performance by many firms and is estimated as the ratio of the firm's Net Income generated to its Total shareholder's Equity (NI/TE). Generally, firms' objectives are to maintain a positive ROE by ensuring the judicious use of capital and a level of financial growth to maximise shareholders' wealth.

Parri passu, some firms experience financial distress and may fail to adequately generate the required ROE (Ndlovu & Alagidede, 2015). On the other hand, Turner, Broom, Elliott, and Lee (2015) argue that firms that face the difficulty of generating positive ROE will therefore face numerous financial difficulties, such as limited access to borrowed funds, contraction in market share, and a negative ROE. A negative return on equity (ROE) has the potential to result in liquidation unless the firms opt for a merger or become targets for acquisition (Lovemore & Brummer, 2003). It is therefore important to understand the financial position of every firm and the factors that drive their key performances.

Historically, ROE has been analyzed in diverse ways. Against this backdrop, no empirical evidence exists on the application of the seven-step DuPont model to the REIT market in South Africa to evaluate a firm's financial performance. The evolution of the DuPont model is evident, progressing from a single factor of income divided by total equity to a more complex framework. This includes the two-factor DuPont model, followed by the three-stage, five-stage, seven-stage, and other subsequent iterations, such as the 10-stage DuPont analysis technique (Sibilski, 2013). Therefore, its application on the JSE is crucial in evaluating the financial performance of listed REITs on the JSE.

### *1.1. DuPont 7-Factor Model*

Barbier (2020) notes that the DuPont analysis was born with two elements: asset turnover and profit margin. Irrefutably, Sheela and Karthikeyan (2012) declare that the DuPont analysis is a pivotal tool in measuring the operating performance of a firm. Further, Bhalla, Kaur, and Sharma (2022) share the knowledge that DuPont Analysis is a financial performance technique that takes advantage of accounting and financial ratios to assess, compare, and add valuable information to financial statements. Therefore, it can give a clear picture of the financial performance of a business entity. According to Bhagyalakshmi, Saraswathi, and Ramakrishna (2020), return on equity (ROE), return on assets (ROA), and return on capital employed (ROCE) are the most comprehensive measures of the performance of a firm. Pakšiová and Oriskóová (2020), in line with Bhalla et al. (2022), contend that profitability ratios provide a swift picture of a firm's financial position; however, profitability ratios lack thorough explanatory power compared to the overall financial analysis. It is well documented that the decomposition of the ROE allows deeper analysis of the component ratios, which could be performed using DuPont.

The present study believes that the utilization of the 7-stage approach of the DuPont model for assessing the operational and financial performances of REIT firms enables the examination of various sub-components of return on equity. This comprehensive analysis can facilitate more informed decision-making for investors, managers, and other stakeholders involved in this burgeoning sector. The 7-stage DuPont model expresses relative details of factors that shape the level of ROE (Gawęda & Sajnog, 2020). The model includes financial elements as defined by Gawęda and Sajnog (2020) that are used to estimate return on sales (RoS), sales and management expenses (SME), miscellaneous operational items (MOI), total asset turnover (TAT), fixed charge ratio (FCR), capital multiplier (CM), and tax returns (TR). We redefined the factors to suit the jurisdiction of the study as prescribed by Gawęda and Sajnog (2020), where the authors indicate that the approach is applicable to any jurisdiction subject to the country's financial reporting style. This approach has not been thoroughly examined in the specific context of South Africa and has not been extensively utilized in general. More so, Gawęda and Sajnog (2020) tested this model on "joint-stock companies listed on the Warsaw Stock Exchange" market.

Given this context, this study proposes that conducting a test of the model in the South African (SA) Real Estate Investment Trusts (REITs) market would yield advantages for both the academic community and the market. This is particularly relevant considering the nascent presence of the model in SA and the adverse consequences experienced by the REIT sector during periods of market turmoil resulting from recent crises. The significance of this paper lies in the following factors: First, there is a lack of empirical research utilizing the 7-step DuPont method to evaluate the performance of Real Estate Investment Trusts (REITs) on a broad scale, particularly in the context of South Africa, as far as the authors are aware. Existing literature in South Africa has primarily focused on ROE measurement through the implementation of the 2-step, 3-step, and 5-step DuPont analysis methodologies. This can be observed in studies conducted by [Barth, Cahan, Chen, and Venter, \(2016\)](#); [Bussin and Nel \(2015\)](#) and [Ndlovu and Alagidede \(2015\)](#). In contrast, most of these studies are not aligned with the REIT sector. Therefore, the current study presents evidence on the application of the 7-step DuPont model. Furthermore, with reference to investment decision significance, this study provides reliable input to investors in South Africa.

### *1.2. The Real Estate Investment Trust Market*

According to the U.S. [Security and Exchange Commission \(2011\)](#), REITs have existed since it was established in 1960 by the American Congress and was created to provide investors with the flexibility of investing in larger-scale income-generating real estate without the need to purchase actual real estate. Investors were granted the opportunity to own shares of REIT firms whose fair amounts of funds are invested primarily in real estate assets. According to the legislative framework established by the United States Congress, Real Estate Investment Trusts (REITs) are permitted to distribute a minimum of 90% of their taxable income to shareholders in the form of dividends ([Basse, Friedrich, & Bea, 2009](#)). Prior to the mid-1990s, REITs were primarily concentrated in the United States and Australia, where they were referred to as Listed Property Trusts. However, it is worth noting that similar REIT structures, albeit in smaller sectors, have already been present in both markets as part of the broader equity market for several decades ([Stevenson, 2013](#)). Different types of REITs now exist, such as diversified REITs, retail REITs, and sector REITs, both in the listed and unlisted categories.

For the past three decades, REITs have experienced large-scale steady growth in these mature markets, including Japan and the UK, attracting other nations across the continents and some parts of Africa to implement REIT regimes in their major capital markets ([Alias & Soi Thos, 2011](#); [Dabara, 2022](#); [Stevenson, 2013](#)). The increased growth in REITs has been felt since 2007, following the crash of the real estate bubble in the United States. REITs have been employed as strategic instruments in addressing financial distress. While there may be variations in the structures of Real Estate Investment Trusts (REITs) across different countries, they share fundamental similarities, particularly in the rationale for their establishment. For instance, by purchasing REIT shares, investors reduce the loans and interest paid on properties they own as investments, as well as the corporate tax exemptions on dividends paid to shareholders. Therefore, REITs is considered a profitable investment vehicle and an environmental and economic development instrument for many economies. However, the REIT market is still in its early stages in several developing economies, including South Africa, and has not been widely embraced by many underdeveloped economies ([Dabara, 2022](#)).

### *1.3. Performance of the REIT Companies*

REITs are seen as a combination of stocks and real property investments ([Alias & Soi Thos, 2011](#)). There is an ongoing debate about whether the performance of REITs should be measured according to the stock market's general performance or real estate performance. The argument has been developed on the assumption that investment in REITs may offer short-term steady cash flows. Conversely, the long-term performance of a portfolio consisting of REITs tends to behave in a similar manner to the performance of direct real estate investment ([Hoesli & Oikarinen, 2012](#)). It is interesting to note that the performances of REITs may also vary between unlisted and listed REIT companies. This is in consideration of the different determinants of various countries and markets.

Generally, well-structured and managed REITs offer attractive total returns and income yields. [Hughes, Speelman, and Turnbull \(2013\)](#) found that REIT companies have distinct qualities when acquiring real estate property assets and generating and securing income. REIT firms work across a broad spectrum and diversify their portfolio of properties and tenants that may provide guaranteed payments in order to maintain a healthy and steady performance. ([Hughes et al., 2013](#)). Therefore, the return from REIT investments will depend on the income return of the real estate within the REIT's portfolio.

With the observed financial crisis and economic downturns, many REITs have become risky investment vehicles, inflicting panic on many investors. According to [Basse et al. \(2009\)](#), the investment risk associated with U.S. (REITs) has increased significantly in the aftermath of the global financial crisis. This trend has been observed in 39 countries with REIT regimes, as highlighted by ([Akinsomi, 2021](#)) after the outbreak of the noble coronavirus pandemic. [Chong and Phillips \(2022\)](#) posit that the negative effects on commercial REITs would have been highly substantial thanks to extreme fiscal and monetary policy interventions. For instance, [Akinsomi \(2021\)](#) explains that the Financial Times Stock Exchange European Public Real Estate Association (FTSE EPRA) and National Association of Real Estate Investment Trusts (NAREIT) indexes are the biggest losers by

-31.83%. The FTSE EPRA Asia–Pacific index is the lowest loser by -23.20% based on 3-month returns as of May 22, 2020. South Africa (SA) REITs saw a 230% decline in market capitalization between December 2019 and September 2020, going from USD 19.35 billion to USD 8.4 billion, in the most liquid, active, and well-capitalized market in Africa (FTSE EPRA NAREIT indexes; (Akinsomi, 2022)). These downturns in the real estate sectors have therefore increased the attention of investors on firms’ cash flows given the high leverage since a significant portion of their capital is from debts entailing high servicing costs.

Figure 1 illustrates the total market capitalisation of REIT companies in South Africa and the total amount of investment in this sector. There has been a gradual increase in total investment funding, as shown by a small upward trend in the number of funds on SA-REITs.

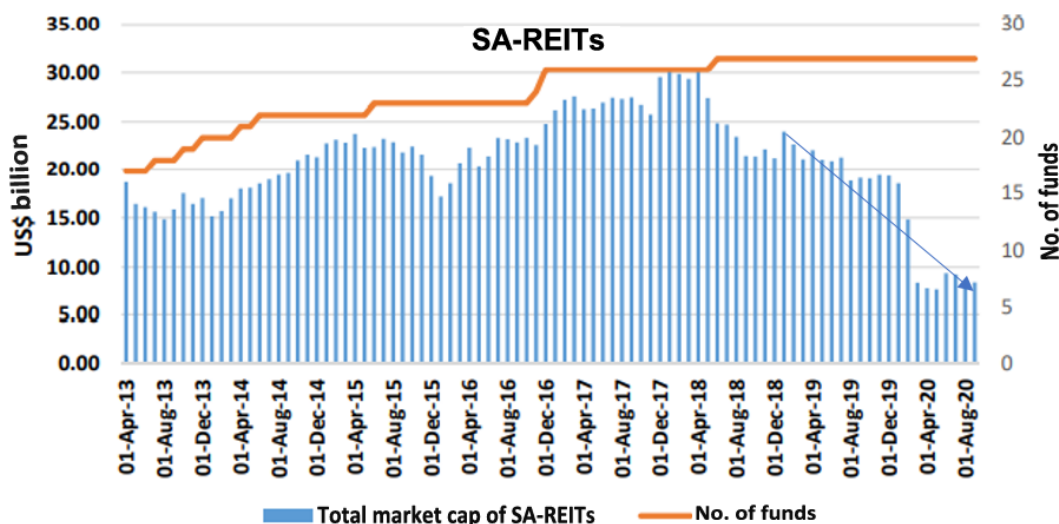


Figure 1. SA-REITs market capitalization trend from 2013 to 2020.

Source: Akinsomi (2022).

#### 1.4. Conception of SA-REITs

The SA-REITs market was officially launched on May 1, 2013, and it is still considered a relatively new and small market, although it is one of the largest markets in Africa. It interacts with other giant REIT markets. As of 2021, it is ranked 10<sup>th</sup> out of 22 on the Standard and Poor Global REIT index, ahead of other larger markets such as Germany, Spain, the Netherlands, and Malaysia (Ijason, Owusu Junior, Tweneboah, Oyedokun, & Adam, 2021). In addition, Akinsomi (2022) cites that SA-REITs occupy the 21<sup>st</sup> position out of 37 REIT markets across the globe on the FTSE EPRA NAREIT index series, which is an index that represents REITs globally in 2020.

The Johannesburg Stock Exchange (JSE) is the main regulatory body that manages the SA-REIT market and ensures that REITs listed adhere to all listing criteria. Some requirements include that REITs must generate 75% of their revenue from rental income, and REIT debt should not exceed 60% of the value of the gross asset. REIT companies should own a minimum of R300 million in gross assets and must pay at least 75% of their taxable income as dividends to their shareholders. The JSE market currently has 27 REITs listed. It is worth noting that there are other REITs in the private sector that are not listed on the exchange. SA-REIT structures include sector-specific REITs such as retail, specialty, residential, industrial, and office, as well as diversified REITs. Their performances are affected by different factors and specific determinants and therefore respond differently to major turbulence. The industry has recently been significantly affected as a result of the COVID-19 pandemic and the deteriorating South African economy.

Table 1. FTSE EPRA NAREIT global indices.

Rank	Country	Market capitalization (USDM)	No of constituents	Weight (%)
1	USA	752,405	122	47.1
2	Japan	164,136	48	10.43
3	China	115,895	58	7.36
4	Germany	87,831	11	5.58
5	Hong Kong	85,238	12	5.42
6	United Kingdom	69,039	39	4.39
7	Singapore	47,463	17	3.02
8	Australia	47,351	12	3.01
9	Canada	39,384	21	2.50
10	Sweden	27,630	14	1.76
21	South Africa	4,761	9	0.30

Source: Akinsomi (2022).

South Africa's economic condition was worsened by the COVID-19 pandemic. Observing the downturns in SA-REIT's performance, it is therefore significant to investigate how this has affected their operation efficiency, profitability, leverage, and management, as well as their overall return on equity. The industry has recently suffered significantly as a result of the COVID-19 pandemic and the deteriorating South African economy. It is important to look into how SA-REIT's operation efficiency, profitability, leverage, management, and overall return on equity have been impacted by the performance downturns. Table 1 shows the country-specific rankings of the REIT market as mentioned by the FTSE EPRA NAREIT.

Table 2 illustrates the different investment categories of SA-REITs and their market capitalization in United States dollars: Diversified REITs have the biggest capitalization percentage in the South African REIT market. Currently, Timber REITs occupy 3% of the SA-REIT, Diversified REITs occupation dropped to 40%, Residential REITs to 6.3%, Office REITs to 6.3%, Industrial REITs to 6.3%, and Retail REITs increased to 38% (IRESS, 2022).

Table 2. SA-REITs by sector as of September 2020.

Sector	Market cap USD billion	Percentage of SA-REITs
Diversified	5.42	50%
Residential	0.11	7%
Industrial and office	0.64	7%
Specialty	0.39	7%
Retail	1.87	29%

Source: Akinsomi (2022).

## 2. Literature Review

### 2.1. Theory of the Dupont Model

The DuPont model is one of the numerous models used to evaluate the health of every business. Barbier (2020) expunges that Donaldson Brown at DuPont de Nemours Company first proposed the DuPont analysis using the return on investment (ROI) model. He made other contributions to guide decision-making, such as the flexible budgeting model (Flesher & Previts, 2013). The DuPont model began with the inclusion of just the elements of estimating the return on asset (ROA), according to Curtis, Lewis-Western, and Toynbee (2015). In using return on assets (ROA) by dividing a firm's net income by the average total asset, Bauman (2014) indicate that this makes it a two-factor model and shows that there is a mathematical connection between the ROA, profit margin (PM), and asset turnover (TAT) to access the operating profit and efficiency of a firm, respectively. Using the net profit margin (another form of return on sales), Gawęda and Sajnog (2020) cite that some early authors proposed a third-factor model to capture financial leverage because the net profit margin includes interest cost on debt expense and a two-factor model fails to account for this element. Since then, the model has been altered to include financial leverage (FL), also known as the equity multiplier (EM), for financing decisions. According to Alias and Soi Thos (2011), this expansion transforms the ROA into the ROE. This has generally been referred to as the three-factor model. Collier, McGowan Jr, and Muhammad (2010) suggest that the model is ideal for strategic decision-making to increase the ROE as it can capture the profitability, operation, and financing activities of a firm. Liesz and Maranville (2008) specifically pinpoint that the modifications to the DuPont model have made it easier to identify firms' areas of concern, creating room for improvement.

Different studies have evolved within the accounting and financial scopes, and different elements are considered in enhancing decision-making using the DuPont analysis. For instance, Weidman, McFarland, Meric, and Meric (2019) applied the three-factor model (PM, TAT, and FL), but the author considered utilizing the total asset rather than the average total asset when assessing the asset turnover ratio. Contrary to Mishra, Moss, and Erickson (2009), who employed gross profit instead of net income in estimating profit margin in the three-factor model. Barbier (2020) extended the three-factor model used by Weidman et al. (2019) considering other liquidity elements from the cash flow returns on capital invested. Barbier (2020) added the elements of depreciation and amortization, and earnings before interest as well as taxes. In this way, the study focused on identifying the elements that could better relate to the ROE within the finance scope. In contrast, new DuPont extensions keep appearing to examine the ROE under certain conditions and eliminate the flaws of earlier iterations. Hawawini and Viallet (1999) proposed modifications to the three-factor model to account for managerial income levels, which have been widely used and adopted as a building block for other modifications such as the 5-, 7-, and 10-factor models. The 5-factor model from Gujjar and Manjunatha (2021) perspective considers the additional impacts of the tax burden (also referred to as the tax ratio, measured as the ratio of net income to earnings before tax) and the impacts of the interest burden (also called the financial cost ratio, measured as the ratio of earnings after tax to earnings before tax).

The 7-factor model proposed by Gawęda and Sajnog (2020) studies the fundamentals of return on equity and how it can facilitate investment decisions and enhance shareholders' value. According to these authors, obtaining a precise definition of some key financial elements is difficult. Gawęda and Sajnog (2020) mention that a more decomposed ROE can enable the identification of key determinants that have an impact on analyzed values both ex-ante and ex-post. The 7-factor model is decomposed of the 3-factor model of Weidman et al.

(2019) and consists of Return on sales (RoS), Sales and Management expenses (SME), Miscellaneous Operational Items (MOI), Total assets turnover (TAT), Fixed charge rate (FCR), Equity/Capital multiplier, and Tax return. There is a need for ongoing research because the differences in composition make it unclear which DuPont model or technique should be adopted to validate the ROE components. Sibilski (2013) also put forth the 10-factor model, which expands on the operating profit margin (OPM) and decomposes the 5-factor model. The model is expanded to include returns on goods (RGS) and selling expense ratio (SEX), general management expenses (GME), miscellaneous operational items (MOI), financial items (FIX), and extraordinary events (EXE). It is a concrete testament that the DuPont model has been criticized for its high reliance on a company's financial statements, which could be easily manipulated and contain errors. The aspect of not being able to incorporate nonfinancial and accounting factors has also weakened the applicability of the DuPont model. However, expanding on the foundational model identifies variables that may be improved and result in efficient management systems and enhanced decision-making procedures. It is therefore imperative to investigate these methods and test them in different settings.

On the other hand, this study omits transformation details that could cause unnecessary complication and focuses on the study objective, which involves testing one of the expanded models (7-factor) in a selected market. We argue that expansion is the "multilayer filter" and should facilitate the analysis of how to adjust factors such as returns on goods sold to enhance performance. Table 3 illustrates the different factor models of the DuPont analysis and the components that are used.

**Table 3.** DuPont analysis models and components.

DuPont models	Components
2 Factor model	$ROA = ROS \times TAT$
3 Factor model	$ROE = ROS \times TAT \times (TA/E)$
5 Factor model	$ROE = OPM \times TAT \times FCR \times (TA/E) \times TR$
7 Factor model*	$ROE = ROS \times SME \times MOI \times FCR \times (TA/E) \times TR$
10 Factor model	$ROE = RGS \times SEX \times GME \times FIT \times EXE \times TAT \times FCR \times (TA/E) \times TR$

Source: \* The model applied in this study.

## 2.2. Empirical Review

Sibilski (2013) conducts an analysis of the historical development of the DuPont model. According to Sibilski (2013), the DuPont model is a model of profitability suitable for making financial decisions and supported by financial analysis since corporations aim to maximise profitability. The author develops a 10-factor DuPont model and modifies it for international corporations with distinctive income statements in order to make it easier to analyze the profitability of a single firm as well as comparative analysis of firms. He compared the 10-factor model to the 5-factor model and concluded that the former model revealed important factors of profitability that were not clearly visible in the later model.

Khan et al. (2022) applied an improved version of the DuPont model to analyse and evaluate the financial performance of Pakistan's 74 textile enterprises. They used the rate of return on equity (ROE) as the primary metric to gauge if a company is doing well by breaking ROE into various components, namely, net profit margin (NPM), asset turnover (AT), and the equity multiplier (EM). Through the application of a multiple linear regression analysis, their findings illustrated that NPM and EM have a positive and large impact on ROE, whereas AT was negative and insignificant. Silambarasan, Saranya, and Raja (2022) used the DuPont model to break down the ROE into "equity multiplier, return on equity, and net profit margin" components and examined the financial performance of the Indian Ultratech cement sector. He used a ten-year period from 2012 to 2021 and suggested that companies will try to improve their asset turnover so as to improve their overall financial health.

By contrasting the returns of C-Corporation and REIT firms, Stotler (2019) used a 3-factor DuPont model to examine the return performance of U.S. firms in the hospitality industry. The return component was tested separately to determine any significant difference between the C-Corp and REIT groups. Stotler (2019) found no significant difference in the component return measures of profit margin, asset turnover, and equity multiplier for the two types of firms in the same industry. The author suggested that a firm's asset type is a more significant factor than C-Corp versus REIT status in determining a firm's return.

In related studies, Saus-Sala, Farreras-Noguer, Arimany-Serrat, and Coenders (2021) applied compositional biplot and cluster analysis to graphically display firms according to profit margin, turnover, and leverage and to cluster firms into strategic groups. Pellika (2009) compared publicly traded lodging REITs using DuPont analysis in the United States and described lodging REITs as not having government requirements on how a firm must efficiently manage its operations through financial leverage. Pellika (2009) found that there is a disparity between individual lodging REITs and the use of financial leverage. Saus-Sala et al. (2021) and Pellika (2009) concluded that profit margin, turnover, and leverage were the main components of the DuPont model.

As stated by Bhalla et al. (2022) "DuPont Analysis' is the financial analysis tool that uses past and current data to compute ratios and determine whether the financial position of a business entity is sound or not by comparing it to its peers or by drawing a trend by comparing the ratios over time (in the business entity itself)

to see whether its financial parameters such as Return on Equity (ROE), Return on Asset (ROA), and Financial Leverages are in the right manner or not". [Bhalla et al. \(2022\)](#) applied the DuPont Analysis to analyse the financial performance of companies to build awareness among investors to take better and more strategic decisions by using the DuPont three-steps and five-steps model.

[Gawęda and Sajnóg \(2020\)](#) applied the 7-factor DuPont model to calculate the cross-sectoral detection of the fundamental determinants of Return on Equity (ROE) of several companies listed on the Warsaw Stock Exchange operating in the industrial sector, the consumer goods sector, and the trade and services sector using EMIS data from 2008 until 2017. The study examined the influence and correlation of the seven components of the DuPont model using the Ordinary Least Squares (OLS) model assessment and Pearson correlation coefficient approach. They concluded that the capital multiplier was the leading factor that shapes the level of ROE in the companies, and with the capital multiplier, it expresses a negative correlation of moderate strength to the companies' ROE.

[Açikgöz and Kiliç \(2021\)](#) used the DuPont Analysis with Multiple Linear Regression method to examine the factors that affect the financial performance and market value of technology sector companies in Turkey. They evaluated how profitability, asset efficiency, and leverage, three components of the DuPont Analysis, affect both the financial performance and market value of technology companies. They noted that asset efficiency and equity multiplier have a positive impact on the market value of technology enterprises and that profitability and asset efficiency, respectively, affect financial performance. The researchers [Açikgöz and Kiliç \(2021\)](#) concluded that factors other than financial performance indicators like profitability, asset utilization efficiency, and capital structure are responsible for the market value of technological firms.

On their part, [Doorasamy \(2016\)](#) used the DuPont analysis by calculating the return on equity (ROE) and return on assets (ROA) to measure the financial performance of the food industry, taking the top three JSE-listed companies, Pioneer Foods, Tiger Brands, and RCI, for the period of 2013-2014. [Doorasamy \(2016\)](#) concluded that investing in Tiger Brands would generate a higher return to shareholders than Pioneer Foods or RCI. Profit margin, asset turnover, and equity multiplier were utilized by [Pakšiová and Oriskóová \(2020\)](#) as variations on the Dupont analysis to examine the influence of a single component on the change in return on equity through regression and correlation analysis. They observed that for financial analysis, the DuPont equation is a useful tool and concluded that the most significant effects on return on equity are asset turnover and profit margin, while the least significant impact is the equity multiplier.

[Bhagyalakshmi et al. \(2020\)](#) used the DuPont analysis to study the performance evaluation of selected automobile companies by measuring the Return on Common Stockholder's Equity (ROE). [Bhagyalakshmi et al. \(2020\)](#) evaluated how well a company operates and earns profit in relation to sales, total assets, etc. Ten (10) automobile companies listed on the New York Stock Exchange (NYSE) were chosen, and published financial statements for a period running from 2013 to 2017 were collected. A correlation and regression analysis was carried out to assess how equity multiplier, net profit margin, and asset turnover ratio relate to return on equity. [Bhagyalakshmi et al. \(2020\)](#) found that there is a positive relationship among all the variables except EM and that there are significant differences in the financial performance of selected companies with respect to Return on equity and Return on Assets.

[Barbier \(2020\)](#) applied multiple linear regression to assess the variables incorporated in the DuPont analysis using data from 34 industrial companies that listed publicly at the Lima Stock Exchange (Peru) from 2013 to 2018 [Barbier \(2020\)](#). DuPont analysis' three-step model was used to begin the analysis, and it was suggested that you use the seven-step model instead because it will help you make better decisions and is applicable to managers and entrepreneurs at all levels of business. In this study, we adopt the 7-step model by [Barbier \(2020\)](#) and [Gawęda and Sajnóg \(2020\)](#), as it proposes a new decomposition of the DuPont analysis, more extended under financial criteria, which aims to enhance not only profitability but also cash generation.

### *2.3. Analysis of Literature Review*

The literature indicates the contradictions of previous studies conducted using the Dupont model in whole as well as REITs. The studies disagree on the number of components useful for the Dupont model, and as such, some advocates for the 3-factor model, the 5-factor model, the 7-factor model, and others suggest the 10-factor model. Studies like [Khan et al. \(2022\)](#) and [Stotler \(2019\)](#) identified NPM and the EM as most significant and highly impactful components of ROE and that asset turnover is insignificant, whereas [Saus-Sala et al. \(2021\)](#) and [Pellika \(2009\)](#) found that profit margin, asset turnover, and leverage are the main impactful components. According to original research by [Pakšiová and Oriskóová \(2020\)](#), the components of asset turnover and profit margin have the most impact on return on equity, whereas the equity multiplier has the least. [Açikgöz and Kiliç \(2021\)](#) argue that the DuPont model is insufficient for market valuation of companies as there are different determinants of market value for technology firms than financial performance components such as profitability, asset utilization efficiency, and capital structure. In sum, few studies have applied the DuPont model in the South African context, and they only used a 5-factor model like the study by [Doorasamy \(2016\)](#). This study aims to clear up the contradiction between previous studies on the components applicable to the Dupont model. The study adopts the 7-factor model as applied by [Barbier \(2020\)](#), [Gawęda and Sajnóg \(2020\)](#), as this focuses on REIT performance. This study is the first of its kind to use the 7-factor DuPont model in South African REITs

to assess and compare the performance of six JSE-listed REITS and apply panel regression to assess DuPont components links with financial performance.

### 3. Research Methodology

Panel data is documented as an important method in longitudinal data analysis. In light of this, the current study employs the panel data technique for six listed REIT companies from 2005 to 2021 to achieve its objectives. Panel data, according to Baltagi (2008), involve pooling observations on a cross-section unit over a number of time frames. On the other hand, Hsiao and Hsiao (2006) cite that the application of panel data has copious merits. The author contends that panel data incorporates both inter- and intra-individual dynamics. Hsiao and Hsiao (2006) cite the following merits of panel data:

- Inference from model parameters is more reliable.
- Minimizes the effects of missing variables.
- Uncovers a dynamic nexus.
- Easy computational and statistical inference.
- Complex behavioural hypotheses testing.

On this note, we rely on theoretical and empirical evidence, and we set up a seven- step DuPont model that includes return on sales (ROS), miscellaneous operational items (MOI), sales and management expenses (SME), fixed charge rate (FCR), tax return (TR), total asset turnover (TAT), and equity multiplier (EM) as the factors that impact the return on equity (ROE) of listed REIT companies in South Africa. Against this backdrop, we specify an econometric regression model as follows:

$$\gamma_{it} = \alpha + \delta_1 x_{it} + \delta_2 x_{it} + \delta_3 x_{it} + \delta_4 x_{it} + \delta_5 x_{it} + \delta_6 x_{it} + \delta_7 x_{it} + \varepsilon_{it} \quad (1)$$

Where  $\gamma_{it}$  is a dependent variable denoting ROE and  $\delta_1$  to  $\delta_7$  represents the coefficients of the independent variables as a measure of factors that influences return on equity.  $\varepsilon_{it}$  is the stochastic error term which measures the unobserved effects.  $\alpha$  is the intercept. Seemingly, the subscripts  $i$  and  $t$  signifies an REIT company within a specific time window. Therefore, we set up the baseline model for the study as;

$$ROE_{it} = \alpha + ROS_{it} + MOI_{it} + SME_{it} + FCR_{it} + TR_{it} + TAT_{it} + EM_{it} + \varepsilon_{it} \quad (2)$$

Equation 2 above specifies a multiplicative DuPont model with seven ratios. Inspired by the works of Kusi, Ansah-Adu, and Agyei (2015) and Wooldridge (2009), we take the natural logarithm of the specified ratios to make the model linear. That notwithstanding, the application of the natural logarithm results in the normalization of a highly skewed dataset. Therefore, we set up a linear model with the introduction of the natural logarithm as follow:

$$\ln ROE_{it} = \alpha + \ln ROS_{it} + \ln MOI_{it} + \ln SME_{it} + \ln FCR_{it} + \ln TR_{it} + \ln TAT_{it} + \ln EM_{it} + \varepsilon_{it} \quad (3)$$

Equation 3 above shows the log transformation of the specified model in Equation 2. On that account, it denotes the natural logarithm. ROS represents return on sales. MOI connotes miscellaneous operational items. SME symbolizes sales and management expenses. FCR is abbreviated as fixed charge rate. TR signifies tax return. TAT implies total asset turnover, and EM infers an equity multiplier.

Based on this account, the variables used in this study are described and summarized in Table 4;

**Table 4.** Description of variables.

Variables	Symbol	Description	Data source
Return on sales	ROS	Earnings before tax divided by sales	Computation on data from IRESS
Miscellaneous operational items	MOI	Earnings on operations divided by earnings on sales and management	Computation on data from IRESS
Sales and management expense	SME	Earnings on sales and management divided by earnings on goods sales	Computation on data from IRESS
Fixed charge rate	FCR	Earnings before tax divided by earnings before interest and tax	Computation on data from IRESS
Tax return	TR	Earnings after tax divided by earnings before tax	Computation on data from IRESS
Total asset turnover	TAT	Sales divided by total assets	Computation on data from IRESS
Equity multiplier	EM	Total assets divided by total equity	Computation on data from IRESS

### 4. Empirical Data and Analysis

Econometrically, estimating a pooled OLS regression on panel data produces biased and inconsistent results. Moreover, pooled OLS has issues with heterogeneity, as it cannot distinguish between different cross-sectional



units. Based on this account, Hsiao and Hsiao (2006) argue that it is extremely troublesome to overlook heterogeneity issues since the results of the regression model will be erratic and meaningless. On the other hand, Kusi et al. (2015) suggest that using the Generalized Least Squares (GLS) panel data is the most suitable econometric technique compared to the pooled Ordinary Least Squares. The GLS panel models are of two types: fixed effect and random effect models. However, in order to choose between a fixed effect and a random effect, we employ the Hausman test. Sheytanova (2015) states that the Hausman test detects the presence of endogeneity in the independent variables. Further, Kusi et al. (2015) expunge that the Hausman test is applied to test the underlying assumptions about the nexus between the disturbance term and covariates.

The Hausman statistical test's results show that the fixed effect model is strongly confirmed ( $\chi^2(6) = 34.96$ ,  $p\text{-value} = 0.000$ ), contrary to the null hypothesis that suggests random effect is acceptable and the alternative that suggests fixed effect is appropriate. Therefore, we reject the null hypothesis and accept the alternative based on the Hausman statistical test result. Again, we use Pesaran test once more to check for autocorrelation. The probability value had no relevance due to the average absolute value of 0.205. Hence, variables used in the study are not autocorrelated. Further, we employ the Breusch-Pagan test to test for heteroscedasticity. Results from the test indicate that variables are homoscedastic with a probability value of 0.716. We use the Shapiro-Wilk normality test to assess the residuals' normality in accordance with the diagnostic testing conducted for the study. The results confirm that residuals are normally distributed with a probability value of 0.0184. The summary statistics from the study are further provided in Table 5.

Table 5. Summary statistics of variables.

Variable	Mean	Std. deviation	Minimum	Maximum
lnROE	0.128	0.390	-0.705	3.619
lnROS	1.126	1.264	0.004	9.979
lnSME	-0.143	1.213	-7.398	2.300
lnMOI	0.030	0.065	-2.314	4.514
lnTAT	0.087	0.075	-0.168	2.300
lnFCR	0.803	1.181	-0.363	2.147
lnEM	1.064	1.621	0.223	12.960
lnTR	-0.127	1.231	-1.714	4.129
N	120	120	120	120

The summary statistics for the variables used in this study are shown in Table 5. The summary statistics depict behaviour and give specific information about the study's data. Additionally, summary statistics are run to identify any outliers among the variables. Table 5 indicates that return on sales has the greatest mean, followed by the equity multiplier, with standard deviations of 1.2641 and 1.6212, respectively. The aforesaid variables have respective minimum and maximum values of 0.0046 and 9.9793 for return on sales and 0.2233 and 12.9601 for equity multiplier, respectively. Besides, the fixed charge ratio reported a mean of 0.8039 as well as a standard deviation of 1.1816 and minimum and maximum values of -0.3638 and 2.1476, respectively. The letter "N" displayed in Table 5 denotes the number of observations. Therefore, the number of observations for the present study is 120.

The study further tested for correlations between variables. The correlation output is presented in Table 6. The correlation matrix aids in assessing the associations that exist among the variables employed in the study. Despite this, the correlation matrix helps to check for multicollinearity. It is worth noting that checking for multicollinearity is significant because it reduces the accuracy of coefficient estimates as well as the statistical power of the regression model. From Table 6, it can be inferred that there was no multicollinearity between them, as all of the variables utilized in the study were fewer than the multicollinearity threshold.

Table 6. Pearson correlation matrix.

Variable	ROE	ROS	SME	MOI	TAT	FCR	CM	TR
lnROE	1.000							
lnROS	0.221	1.000						
lnSME	0.171	0.533	1.000					
lnMOI	0.101	0.605	0.161	1.000				
lnTAT	0.514	0.063	0.019	0.077	1.000			
lnFCR	0.206	0.147	0.147	0.064	-0.041	1.000		
lnEM	-0.167	0.011	0.004	0.025	-0.053	-0.473	1.000	
lnTR	0.007	-0.109	-0.145	0.003	-0.083	0.082	-0.235	1.000

## 5. Results and Discussion

Table 7 below shows that return on sales has a positive relationship with return on equity. This nexus is statistically significant at the 1 percent significance level. This suggests that performance will rise by 0.1832 for every percentage point increase in return on sales. The result is at variance with the findings of Fitra and Al

Ashry (2019), who reported a negative and insignificant coefficient of sales growth. Return on sales measures operational efficiency and provides a detailed understanding of a product’s profit per sale. In the context of the current study, the significant positive relationship signifies that listed REIT companies are highly efficient without any looming financial troubles. Therefore, the evidence adduced in Table 7 fortifies the argument that REIT companies can increase their performance through efficiency. In this regard, efficiency should be a master key for REIT companies in South Africa.

Sales and management expenses have a positive relationship with return on equity. However, this relationship is insignificant even at the 10 percent significance level. On the other hand, Table 7 indicates that as miscellaneous operational items increase in years, its return on equity decreases in the same way. This is explained by the negative relationship between miscellaneous operational items and return on equity, which is marginally significant at the 10 percent significant level. We find that a percentage increase in miscellaneous operating items will reduce the return on equity by 0.0056. Besides, the negative relationship explains that listed REIT companies have unplanned expenditures. Unexpected costs cannot be forecast, but they can be managed. The finding presupposes that miscellaneous operational items pose a threat to the performance of listed REIT companies in South Africa. The evidence presented in Table 7 buttresses the debate that REIT companies fully utilize their resources. This provides the locus of the inferred statistical output where a significant positive nexus exists between total asset turnover and return on equity. Therefore, a percentage increase in total asset turnover will result in a 1.6710 rise in return on equity. The result is consistent with studies by Kusi et al. (2015) and Little, Little, and Coffee (2009), which found a positive correlation between total asset turnover ratio and return on equity. Besides, the finding runs counter to the work of Sunjoko and Arilyn (2016), who validate that total asset turnover negatively correlates with profitability. Seemingly, the finding is acceptable because companies with large assets will fully utilize their resources to create more sales from their assets. Therefore, it is increasing efficiency and reducing the per-unit cost of assets to boost the performance of the company.

Again, a positive and insignificant association is reported for the relationship between fixed charge ratio and return on equity. Although insignificant, the reported positive result is not startling. This said, the positive association indicates that listed REIT companies in South Africa have the capacity to cover their fixed charges at a faster rate. Hence, it makes the companies more effective and profitable. In addition, an insignificant positive relationship between the equity multiplier and return on equity is reported. The finding is understandable, as the lower positive coefficient of the equity multiplier indicates that listed REIT companies have a lower level of debt; hence, its impact on return on equity is very crucial. Additionally, the lower equity multiplier demonstrates that REIT companies in South Africa rely more on equity than debt to finance their assets. Therefore, there is a low level of risk associated with listed REIT companies in South Africa. Unquestionably, equity multiplier measures the proportion of company’s assets that are financed by equities rather than debt. Likewise, tax returns had a positive relationship with return on equity. The finding is in tandem with the work of Kusi et al. (2015), who reported an insignificant positive link between the tax effect and return on equity. Table 7 below shows the regression results for the study.

**Table 7. Regression results.**

Variables	Coefficient	Std. error	T-statistics	P-value
lnROS	0.183***	0.049	3.731	0.000
lnSME	0.028	0.042	0.655	0.514
lnMOI	-0.005**	0.003	1.806	0.077
lnTAT	1.671***	0.377	4.422	0.000
lnFCR	0.011	0.034	0.327	0.744
lnEM	0.001	0.064	0.028	0.782
lnTR	0.004	0.038	0.125	0.990
C	-0.256***	0.059	4.289	0.000
R <sup>2</sup> = 0.695				

Note: Significance level: 1% (\*\*\*), 10%(\*\*).

## 6. Conclusion

Based on the facts described above, the study makes certain inferences. There is empirical evidence available to substantiate the assertion that the seven-step DuPont model provides a more comprehensive explanation for the return on equity of publicly traded real estate investment trust (REIT) businesses in the South African context. While certain factors, such as sales and management expenditures, fixed charge ratios, equity multipliers, and tax returns, were found to be statistically insignificant, it is worth noting that their coefficient indications were consistent with our expectations. The seven-step DuPont model is an expansion of the previously established five-step DuPont model. However, it is important to note that there is limited empirical information available about its practical implementation. Our analysis reveals a statistically significant positive correlation between return on sales and return on equity. Similarly, the total asset turnover had a comparable association. Contrarily, miscellaneous operational items had a negative and significant relationship with return on equity. Furthermore, the total variation of return on equity explained by the explanatory variables was 69.51

percent. The study affirms that listed REIT companies should have proper planning or a planned budget to reduce the burden of miscellaneous expenses and remain efficient and profitable. Based on the evidence presented in Table 7, we conclude that the seven-step DuPont model has a better explanation of firm-related parameters. However, it is important to note that the study's breadth is limited due to the reliance on financial reports as the primary source of data. Financial reports inherently include some limitations, which encompass practises such as account manipulation, inaccurate or inflated asset assessments, and several other forms of distortion. This report, however, functions as a catalyst for the implementation of the seven-step DuPont model in the context of South Africa.

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