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**The Use of DuPont Analysis in Equity Valuation;  
Empirical Study of Kenyan Market**

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## **Abstract**

The paper examined the stock market's association with the information in the DuPont components variables through long-window tests and found that the market recognized the future Return on Net Operating Assets, *RNOA*, and implications of these components. To test whether stock market returns were associated with the DuPont components, the study conducted both long-window association and short-window information tests. There are two parts to the model, a cross-sectional analysis and a time series analysis. The study found that DuPont Decomposition of *RNOA* had been derived from a theoretical and parsimonious framework of valuation. Moreover, it related to operational assets of the firm unlike other analyses. Consequentially, long window stock returns were positively correlated to changes in asset turnover. The investing Kenyan public has a great deal of interest in the stock market. Unfortunately it is recognized that majority of local investors are not able to fully maximize their returns due to financial illiteracy. The paper seeks to educate investors by improving their financial analysis knowledge as a means to making better decisions that will result to overall improved portfolio performance.

**Key words:** financial statement analysis; DuPont analysis; equity valuation

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## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the study

DuPont analysis was developed by E.I. Du Pont de Nemours in 1919; it is used to evaluate company performances in three major areas: profitability, turnover and leverage. This paper comprehensively explores the DuPont components in order to demonstrate that the three areas influences stocks return. DuPont analysis ties the ratios together in a structured way in the analysis of financial statements to determine equity payoffs (Nissim, 2001).

DuPont analysis decomposes return on net operating assets into two multiplicative components: profit margin and asset turnover. These two accounting ratios measure different constructs and, accordingly, have different properties. Prior research has found that a change in asset turnover is positively related to future changes in earnings (Soliman, 2008). Return on Equity (ROE) effectively measures how much profit a company can generate on the equity capital investors have deployed in the business, and can be used over time to evaluate changes in a company's financial situation (Fruhan, 1979). Standard DuPont analysis decomposes ROE into the three multiplicative ratios of Profit Margin (PM), Asset Turnover (ATO), and Leverage. Work by Nissim (2001) algebraically rearranges ROE to abstract away from financial leverage and arrive at Return on Net Operating Assets (*RNOA*).

Since the landmark studies of Ball & Brown (1968) and Beaver (1998), accounting researchers have worked to understand how and why earnings and security returns are associated. Beaver (1998) argues that one theoretical link between earnings and share prices are that current earnings provide information to predict future earnings. Consistent with this theme, researchers have looked for current financial statement information that aids in predicting future earnings, arguing that this should be the primary goal of fundamental analysis (Penman S.H., 1996). To this end, several approaches have emerged in the literature. Lipe (1986) decompose earnings into six components and find that more transitory components have a smaller relation with stock returns.

Along the same lines, Fairfield et al. (1996) use the order of line items on the income statement to decompose earnings to improve predictions of *ROE* and find that line items farther down the income statement are less persistent. Ou & Penman, (1989) combine a large group of financial ratios into one summary measure and estimate its association with future stock returns. Holthausen & Larcker (1992) extend this analysis and use the variables to directly predict future returns.

Lev & Thiagarajan(1993) take a different approach and identify a group of financial ratios used in practice by experts and examine their correspondence with contemporaneous long-window stock returns. AB (1997, 1998) extend this analysis by using the same variables and find that some of the ratios (1) predict future earnings changes, (2) are used by analysts, and (3) can predict future returns. Sloan, (1996) decomposes earnings into accruals and cash flows and finds that firms with higher operating accruals tend to have lower future earnings and returns.

Analysts rely on equity valuation models to create their forecasts for securities. Further studies have been done by M. Soliman and Ge (2007) to examine whether analysts fully impound DuPont component information into their forecasts. Since the primary task of equity analysts is to predict future earnings, it is expected that their forecasts contain all relevant information. A number of studies such as Bushee, (1997) show that analyst forecasts are inefficient in the sense that they do not fully incorporate past information available at the time of their forecasts. The future forecast error tests were used to examine whether analysts fully capture all the information in the components and thus place a higher threshold of sophistication on analysts. Consistently, if analysts fully impound the information in the DuPont components when creating forecast, then the expected coefficient is zero (Soliman, 2008).

The analyses done by Joos(1998) based on accounting and industrial organization literature compared the predictive power for *ROE* of three types of information variables. The first variable included fundamental signals in the financial statements aggregated as a fundamental score of the firm.

The second was accounting recognition variables based on the book-to-market [BTM] ratio of the firm (delayed and biased recognition), and finally the variables that measure the characteristics of the firm's industry (concentration and barriers-to-entry) and the market share of the company (Joos, 1998).

To summarize, their analyses lead to three findings. First, the financial statements of firms contain fundamental information about the future profitability of the firm not reflected in current profitability. Second, the variables based on the *Book to market ratio* capture the effects of accounting recognition that help to predict of future *ROE* in the presence of current *ROE*. Third, the results for the industry characteristics variables were mixed. Concentration and barriers-to-entry provide little or no predictive power for future *ROE* whereas market share proves to be a strong predictor. This is consistent with recent claims made in the literature that market share is a more important determinant of a firm's profitability than the concentration and barriers-to-entry of the industry in which it operates. Overall, the conclusion of our analyses is that all three sets of variables capture some piece of information about future *ROE* incremental to current *ROE* and to each other (Joos, 1998).

The previous studies discussed earlier provide a base for this paper on the effectiveness of DuPont analysis for equity valuation. The focus of this paper is centered on whether market participants, such as stock market investors, use this information when valuing stocks.

## 1.2 Problem Statement

This paper examines whether there is a statistical association between information in the components of DuPont and market equity returns in Kenya. This would suggest that the information in the components is correlated with information used by investors therefore captures information that affects equity valuation. This stream of research shows that investors sometimes do not understand the future implications of current earnings mapping into future earnings and that a trading strategy exploiting this information can earn abnormal returns (Doyle, Lundholm, & Soliman, 2003).

This study adds to the literature by comprehensively examining investor and analyst reactions to the DuPont components along dimensions adopted by (Soliman, 2008) for financial markets similar to Kenya's. Furthermore, since there are very few studies on the use of DuPont analysis for equity valuation in Kenya, this study will contribute to filling this gap in research.

## 1.3 Research Objective

- To investigate whether there is a statistical association between information in the components of DuPont and market equity returns in Kenya.
- To identify how and why earnings and security returns are associated.
- To investigate to which extent DuPont analysis as a structural approach to financial statement analysis can be used for equity valuation.

#### 1.4 Justification of Study

The investing Kenyan public has a great deal of interest in the stock market. Unfortunately it is recognized that majority of local investors are not able to fully maximize their returns due to financial illiteracy. The paper seeks to educate investors by improving their financial analysis knowledge as a means to making better decisions that will result to overall improved portfolio performance.

Traditional fundamental analysis, before modern finance, was very much grounded in financial statements. However, financial statement measures were linked to equity value in an ad hoc way. Neither is there a comprehensive scheme advanced for identifying, analyzing and summarizing financial statement information in order to draw a conclusion as to what the statements, as a whole, say about equity value (Nissim, 2001). Drawing on recent research on accounting-based valuation, this paper ventures to produce a structural approach to financial statement analysis for equity valuation using the DuPont analysis.

To this end it will come to show that firms should establish capacities in their respective institution to be able to continuously train investors to interpret key financial indicators such as the DuPont components to support in informed decision making. This will avoid information asymmetry and ensure the market operates in near perfect competition which will enhance confidence, and make market participants to fully appreciate the role of financial information components in investment decision making.

## Chapter Two

### Literature review

#### 2.1 Overview

The current state of research on components from DuPont analysis, which decomposes return on net operating assets into profit margin and asset turnover, differ on the explanatory power of DuPont components with respect to changes in future profitability (Soliman, 2008).

There are limitations on using DuPont Components for equity valuation such as volatility due to business normal sales cycles. Also it may be high or low depending on the general profitability of the industry where the company is categorized. A company may have an inflated ROE because of a very small value of book equity its balance sheet rapid growth of large share repurchases (William E., 1979).

This study contributes to literature by outlining different authors approach to valuation theories of DuPont analysis with an aim of reducing the wide variations in accounting based equity valuation. This paper also shows how decomposition leads to parsimony in analysis, where ratios further down the hierarchy are utilized only if they provide more information than those higher up. This proves that extended decomposition of RNOA shows how the variable components aggregate. But there may be interactions: a certain level of one component may imply a certain level for another (Nissim, 2001).

In spite these limitations, the study is primarily a replication of earlier work, but makes a small contribution in that it replicates the prior findings in a different sample and ensures that the result is robust to other control variables from the literature using slightly updated tests. The focus of this paper is centered on whether market participants, such as equity analysts and stock market investors, use this information when valuing stocks.

## 2.2 Equity Valuation Theories

The debate on equity valuation using accounting valuation method was pioneered by Graham, Dodd and Cottles's (1962) where they formulated security analysis that analyzes fundamental through the financial statements. According to Nissim (2001), the approach used by the earlier researchers of equity value being determined by future earnings power, had no explicit justification for using future earnings as a valuation attribute. There is still much debate on the proper specification of the returns-earnings regression. Kothari (2001) suggests that using an earnings-level specification reduces the bias in the coefficients because prices lead earnings. However, (Easton, 1991) argues that change in earnings is also a relevant variable. An alternative approach is to include future earnings as an independent variable. The study conducted by (Soliman, 2008) estimated regressions with one or the other of either earning level or change in earnings along with the DuPont components and found similar results on the variables of interest. Accordingly this paper included the earnings variable in its long window test.

Valuation involves forecasting payoffs. Forecasting is guided by an equity valuation model that specifies what is to be forecasted (Nissim, 2001). For instance the dividend discount model directs the analyst to forecast dividends (Bailey, 2005). Because it focuses on accrual-accounting financial statements, the residual income valuation model, that was revived through the work of (Ohlson, 1995), serves as an analytical device to organize thinking about forecasting and analyzing financial statements for forecasting. This model is a statement of how book value and forecasted earnings relate to forecasted dividends and thus to value. The ratio analysis in the study by (Nissim, 2001) follows from recognition of standard accounting relations that determine how components of the financial statements relate to earnings and book values.

The focus on the residual income valuation model is not to suggest that this model is the only model, or even the best model, to value equities. According to (Penman, 1997) shows that dividend and cash-flow approaches give the same valuation as the residual income approach under certain conditions. This study chooses to exclude the residual income model as it is based on accrual accounting which goes beyond the scope of the study.

## 2.3 Prediction of equity return on Equity (ROE): Fundamental Signals, Accounting Recognition, and Industry Characteristics

### 2.3.1 Fundamental signals

ROE combines earnings and book value of equity and is therefore a key summary measure of the financial statement. The role of ROE in equity valuation is the starting point of (Joos, 1998) analysis. Penman (1997) states that fundamental analysis of the financial statements of the firm is characterized as observing information that projects future ROE. Work by Thiagarajan, (1993) studies the relation between a set of fundamental signals in the financial statements of the firm and current security returns and future earnings changes. Based on (Nissim, 2001) the research has not produced a convincing financial statement analysis for equity valuation and that previous research defers to expert judgment and identifies ratios that analysts actually use in practice. In the same spirit this paper ventures to produce a structural approach such as DuPont analysis to financial statement analysis for equity valuation. The structure not only identifies relevant ratios, but also provides a way of organizing the analysis task.

### 2.3.2 Accounting recognition

Beaver and Ryan (1996) [hereafter, BR] define the accounting recognition variables based on the divergence between market value and book value of the firm. BR explain how the ratio of these two measures, the book-to market ratio [*BTM*] or the inverse of the *PB*, can be statistically decomposed to reveal two important features of accounting recognition: delayed and biased recognition. (Ryan, 1996), show that the two components of *BTM* are useful in predicting future *ROE* beyond current *ROE*. However there exists a strong negative association between delayed recognition and *ROE* (Joos, 1998). Accordingly, this study excludes the *BTM* variable in its analysis, because it deviates due to unrealized gains and losses on assets and liabilities where as they are reflected in market values immediately.

### 2.3.3 Industry Recognition

Concentration and barriers-to-entry provide little or no predictive power for future *ROE* (Joos, 1998) whereas market share proves to be a strong predictor. This is consistent with recent claims made in the literature (Soliman, 2008) that market share is a more important determinant of a firm's profitability than the concentration and barriers-to-entry of the industry in which it operates.

Industrial economists have proven that *ROE* exhibits a mean-reversing pattern (Joos, 1998). This is further elaborated in (Soliman, 2008) where reasons are outlined as to why competitive forces affect Asset Turnover and Profit Margin differently. Large profit margins often draw new entrants into the marketplace or quick imitation of new ideas from existing rivals. The resulting competition causes high profit margins to revert to normal levels, suggesting more transitory benefits. Unlike profit margin, however, competition may be less threatening to an efficient deployment of assets. It is more difficult to imitate another firm's efficient production processes because such limitation often involves large and costly overhauls of current factories and operations (Soliman, 2008). This paper includes market share information of the respective firms in an industry as an exogenous factor in equity valuation.

#### 2.4 Predictions of future RNOA using DuPont Components

Soliman (2008) conducted two tests to ensure that explanatory power of DuPont Components is truly incremental and robust to other earnings predictors from the literature before moving on to the larger question of whether this predictive power is used by market participants. He first controlled for the fundamental signals proposed by (Lev & Thiagarajan, 1993).

$$\Delta RNOA_{t+1} = p_0 + p_1 RNOA_t + p_2 PM_t + p_3 ATO_t + p_4 \Delta RNOA_t + p_5 \Delta NOA_t + v_{t+1}$$

Yohn, Fairfield, & Sweeney (2001) were the first to address the question of future predictive power and find that  $\Delta ATO$  is positively associated with future changes in *RNOA*, but that level of *PM* and *ATO* has no predictive value. The extended decomposition of *RNOA* shows how the variable components aggregate. Researchers have found that there may be interactions: a certain level of one component may imply a certain level for another;

*PM and ATO*. The DuPont decomposition recognizes that  $RNOA = PM \times ATO$  and it is commonly recognized that firms can generate the same *RNOA* with different combinations of margins and turnovers (Nissim, 2001). According to Selling and Stickney (1989) that is often displayed in texts, the rank correlation between Core Sales *PM* and *ATO* is -0.40.

*RNOA and Growth in NOA*. They both combine to grow residual operating income. Firms that generate higher *RNOA* have an incentive to grow their net operating assets. But growth in *NOA* reduces *RNOA* if the accounting is conservative (Nissim, 2001). The rank correlation between the two is 0.24.

This study accordingly recognizes the interaction between variables in conducting its tests and provides for means of identifying such occurrences.

## 2.5 Variable Decomposition

### 2.5.1 DuPont Decomposition

DuPont is one of oldest analyses which present the easier way for better understanding of return ratios and its changes (Botika, 2012). DuPont decomposition ties the ratios together in a structured way. *RNOA* is operating income before interest divided by average net operating assets (*NOA*), where *NOA* is Operating Assets – Operating Liabilities. Operating assets is total assets less cash and short-term investments. Operating liabilities is total assets, less the long- and short-term portions of debt, less book value of total common and preferred equity, less minority interest. Growth in Net Operating Assets ( $\Delta NOA$ ) =  $(NOA_t - NOA_{t-1})/NOA_{t-1}$ . *RNOA* is decomposed into the multiplicative components of *PM* (Operating Income / Total Sales) and *ATO* (Sales / Average *NOA*).  $\Delta PM_t = (PM_t - PM_{t-1})$ , and *ATO* is measured similarly. A future change in *RNOA* is  $\Delta RNOA_t = RNOA_{t-1} - RNOA_t$  (Soliman, 2008).

Nissim (2001) views DuPont decomposition as an algebra that not only explains how ratios sum up as building blocks of residual income but also establishes a hierarchy so that many ratios are identified as finer information about others. Therefore decomposition leads to parsimony in analysis. Ratios further down the hierarchy are utilized only if they provide more information than those higher up. Ratios that involve financing activities are ignored if financial items are at their fair value on the balance sheet. *RNOA* and growth forecasts can be simplified if components are constant, so the analyst can focus on the key drivers that will affect the forecast (Nissim, 2001). This study seeks to evaluate whether DuPont components provide the same information to market participants before their decomposition and if they were to be decomposed.

## 2.6 Relationship between ROE and RNOA

There is a direct relationship between ROA (measures how effectively the company is being run) and ROE (measures how well the owners are doing on their investment) (S. Mishkin, 2004).

Thus the relationship is determined by an equity multiplier which is measured as assets divided by equity capital. This describes what happens to ROE when a bank holds a smaller amount of equity for given amount of assets (S.Mishkin, 2004)

Further studies conducted on the relationship between ROA and RNOA describe a different measure that proves more effective than the equity multiplier (Soliman, 2008).

Work by Nissim(2001) rearranges *ROE* to abstract away from financial leverage and arrive at *RNOA* since ROE can be affected by the firm's choice of capital structure, yet changes in the firm's capital structure may not be value relevant for this study as follows:

$$ROE = RNOA + [FLEV \times SPREAD]$$

*FLEV* is financial leverage and *SPREAD* is the difference between return of the firm's operations and borrowing costs. *RNOA* captures the firm's operating profitability without the effects of financial leverage and is becoming commonly used in the valuation literature (Fairfield, Accounting classification and the predictive content of earnings, 2001). However there may be interactions: a certain level of one component may imply a certain level for another. In this case the relationship between *FLEV* and *SPREAD* surprisingly; negative (Nissim, 2001). This is because higher financial leverage presumably results in higher borrowing costs, reducing the *SPREAD*. The debate still continues as to whether high median *RNOA* or *SPREAD* is the reward to business risk and firms with high business risk choose to have lower financing risk. This study excludes the leverage effect in its equity valuation, because large debt burden increases ROE without increasing profitability or efficiency of the firm.

## 2.7 The Importance of Consistency

### 2.7.1 Ten Years of Return on Equity Performance

From a conceptual standpoint, there is a simple tradeoff regarding the number of years that one requires of consistent Return on Equity performance (Jensen Investment Management, 2011). Work by William E., (1979) suggests the studies on ROE should use 10 years, argues that a shorter time period of three years period of consistent ROE a lot of companies will meet the requirements. Also a longer time period of ROE e.g. 20 years will require a company to have a longer track record of business performance and fewer companies will make the cut.

However recently traded companies must build a large track record therefore will be locked out of the research if a 10 year scope is to be used.

Besides simply affecting the number of companies that meet the screen, the number of years selected for the screen can impact the results in many other ways. For example, if companies are selected that have achieved a particular minimum.

Return on Equity for five consecutive years, and those five years happen to be 1995 through 1999 (a period of rapid economic growth), the results will show a very different group of companies than if the years had been 2000 through 2004 (a period of subpar economic growth) (Jensen Investment Management, 2011). If the view is taken that abnormal business cycle tends to occur every seven to eleven years, then a 10yearperiod should typically include economic expansions and contractions, as well as the other economic fluctuations that go along with such a cycle. This study uses a 10 year time frame that would demonstrate a company's ability to maintain a high level performance throughout changes in the economic environment.

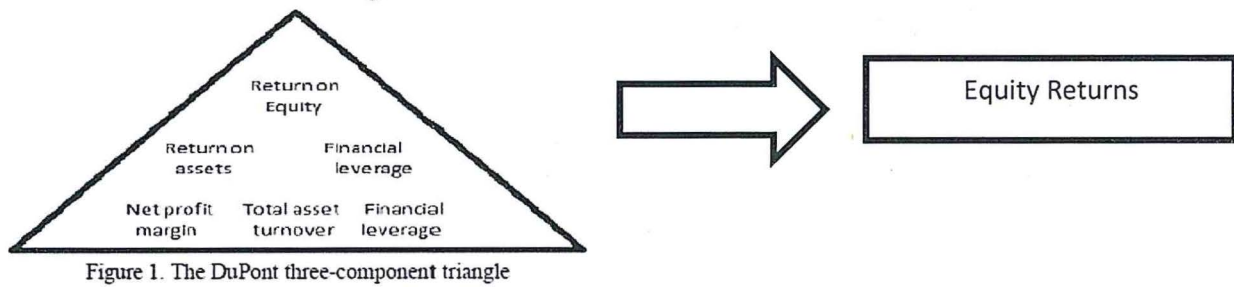
#### **2.7.2 Return on Equity of 15% or above**

High ROE shows if a company is generating profits at a rate in excess of Cost of Equity capital, creating value to shareholder. Cost Equity estimates return a shareholder expects from an equity security (William E., 1979). Companies with high ROE for a number of consecutive years are likely to maintain high ROE in the subsequent years (Jensen Investment Management, 2011). Therefore the units of analysis in this study are the firms whose ROE is 15% or greater for the last 10 consecutive years.

## 2.8 Conceptual Framework

Independent Variable

Dependent Variable



### 2.8.1 Dependent variable

The dependent variable used in this study is the stock returns measured as compounded buy-hold market-adjusted returns (raw return minus the corresponding value-weighted return), inclusive of dividends. This measure was also used by Soliman (2008). This paper adopts this measure since using returns on the LHS can help avoid econometric issues and mitigates any intertemporal constant correlated omitted variables.

### 2.8.2 Independent variable

The first independent variable in the model is earnings ratio. Earnings ratio is measured as earnings per share divided by market value of the stock. According to Soliman (2008) the coefficient of earnings ratio is positive proving that the variable is incrementally informative to stock market participants. The other independent variables are as a result of DuPont components which decomposes a firm's return on net operating assets (*RNOA*) into profit margin (*PM*) and asset turnover (*ATO*) where  $RNOA = PM \times ATO$ . *PM* and *ATO* are accounting signals that measure different constructs about a firm's operations. *PM* is measured as net income divided by sales while *ATO* is sales divided by assets. This study includes  $\Delta PM$  that measures the growth rate in operating income relative to the growth rate in sales.  $\Delta ATO$  reflects change in the productivity of the firm's assets and ultimately measures growth in sales relative to growth in operating assets each component measures a different aspect of a firm's operations. Thus, simply using the aggregated level of *RNOA* may result in the loss of some predictive information.

## CHAPTER THREE: METHODOLOGY

### 3.1 Introduction

This chapter outlines the methods that were used to address the objectives and research questions. It also provides the research design, the target population, sample and sampling methods data collection methods and procedures, and finally data analysis procedures.

### 3.2 Research Design

This study uses a quantitative approach, in establishing the relationship between market equity returns and information in the components of DuPont. The justification for using quantitative approach is to be able to enhance the reliability of the findings and identify any inconsistencies (Neuman, 2006). The main method of data collection is through reference to the company's financial statements that are available from several sources (but mainly from the companies' offices) to study the stock returns and financial ratios relationship. The share prices of companies was also available from the press (main source was the Daily Nation and the Nairobi Stock exchange 2007 and 2014 Handbooks). The study is also cross sectional and longitudinal. In establishing the relationship between stock returns and DuPont variables, share price is analysed from the years 2007 up to 2014. The time period is chosen because of availability of data financial statements and recommendation of corporate governance. *power!*

### 3.3 Population

The main population for the purpose of this study is the companies listed on NSE 20-share index. As at December 2013 there were 64 listed companies (NSE, 2013) although some companies had their trading suspended e.g. Uchumi Supermarket Limited. The listed companies are classified into three main categories i.e. The Main Investment Market (with has four categories, Agricultural, Commercial and Services, Finance and investments and industrial and allied), the Alternative Investment Market and the Fixed Income Sector.

Only 50 companies (see appendix one) under the Main Investment Market and Alternative Investment market were considered. The remaining 14 companies are excluded from the study because some were not listed during the entire period under consideration, either annual reports were not available (for example Baumann), or there were changes in the structure and reporting (for example CFC Stanbic) and others were suspended from listing.

Appendix one shows the companies analyzed and the nature of their business as analyzed from the relevant annual reports of directors, the chairman's or Chief Executive Officer's (CEO).

For the purpose of this study the important regulations are those that require listed firms to prepare annual reports and present these to the members at the AGM (CA, 1962). These financial statements provide information about the accounting performance and stock market returns.

In addition, the Nairobi Stock Exchange prepares handbooks (2012 and 2013) and other information that is published in the press about the market price of the companies' shares and hence assists in evaluating stock market performance. Companies listed on the NSE prepare their financial statements in accordance with the requirements of the Companies Act and International Financial Reporting Standards (IFRSs).

### **3.4 Sample and Sampling method**

According to the literature review the main objective is to use all the 64 listed companies therefore eliminating the need to sample. However the companies have to be narrowed down to 50 companies. This is because even though Nairobi Securities Exchange companies are required to present copies of their financial statements to the various regulators, some companies do not do the same. Obtaining copies of the same proves difficult and this reduces the number of companies to be analysed.

### **3.5 Data Collection methods**

The empirical tests employ publicly available data from publicly traded companies' annual reports. These are considered to be secondary sources of information. A quoted company is required to submit a copy of its annual returns to regulators like the Capital Markets Authority. Some financial statements are also available on-line. Secondary sources of data are considered to have several weaknesses such as their being approximates, having limited access to and the reliability of the collection procedure (FrankfortNachmias, 1996).

It is important to note that the information from the financial statements is structured to address the objectives of the study. Therefore this study focuses on median ratios that are presented as representative numbers. Balance sheet numbers are averages of beginning and ending amounts. All income numbers are after tax, with the appropriate tax allocation at all points to estimate multivariate models to forecast stock returns.

### 3.6 Data analysis procedures

The financial statements are analyzed and financial information on the Profit Margin (PM), Asset Turnover (ATO) and Return on Net Operating Assets (RNOA) summarized. Other ratios already provided in the financial statements like Earnings per Share were also consolidated. Thereafter the ratios are computed based on the formulas given in the literature.

### 3.7 Data Analysis

To test whether stock market returns are associated with DuPont components, this study conducts a long window association test that was adopted by (Soliman, 2008). The tests show that the DuPont components are incremental to earnings and earnings changes in explaining contemporaneous returns, and that adding them to the regression doubles the traditionally low adjusted  $R^2$  that come with these tests (Soliman, 2008). Regression is the main tool of analyzing the relationship between market returns is associated with DuPont components. This is because regression is the most suitable tool to use in studying relations between variables (Johnson, 2007).

As opposed to an alternative method i.e. covariance, regression is able to provide not only the relationship between two or more variables (whether it is positive or negative) but also provides information about the strength of the relationship (Johnson, 2007). Furthermore covariance cannot be used where there are many variables.

To establish the relationship between stock market returns and DuPont components, the long window association test is used. This is preferred because there are few data items (number of years is only eight). Even though multiple regressions could be used at the sector level, the nature of the performance variables tended to report a high multicollinearity. Multicollinearity arises when the independent variables correlate with each other such that the regression equation cannot be relied upon (Defusco, 2001).

Multiple regressions carried out at the sector level confirmed multicollinearity because the variables have high Variance Inflation Factors (VIF). However the multiple regressions that is carried out on the entire stock market has a lower variance inflation factor.

Even though correcting for multicollinearity requires a variable to be removed from the equation (Defusco, 2001), the purpose of this study is not to develop a regression equation for stock market

returns and DuPont components but to establish the nature of the relationship. Furthermore removing some of the variables makes the study less robust.

Other than multicollinearity, an additional problem that was expected to arise was the serial correlation or autocorrelation. Autocorrelation arises when regression errors are correlated across observations, and therefore, the important measures such that the standard errors limit the usefulness of the analysis of variance (Defusco, 2001). Auto correlation can be checked using the Durbin Watson (DW) Statistic which generally highlights a possible positive serial correlation if the value is significantly below two, and a negative serial correlation if the DW is significantly higher than two (Defusco, 2001). The level of serial correlation is also based on the number of observations and the number of independent variables.

### 3.7.1 Model

The study conducts a long-window association test (Soliman, 2008). There are two parts to the model, a cross-sectional analysis and a time series analysis. The cross-sectional analysis summarizes the mean, median and other aspects of the distribution of ratios pooled over all firms and all years, 2007-2014 that gives typical numbers for the ratios in the data. This is of particular help for ratios like *RNOA*. The time series analysis documents how ratios typically evolve over time. With the view of using current ratios as predictors of future earnings drivers, the time series analysis documents the transition from current ratios to future ratios.

With parsimony in mind, these models were estimated by including ratios in the hierarchical order of the decomposition so that ratios were only introduced if they had explanatory power beyond higher level ratios under which they nest.

### 3.7.2 Long window test

The long window association tests show that the DuPont components are incremental to earnings and earnings changes in explaining equity returns, and that adding them to the regression doubles the traditionally low adjusted  $R^2$ , that come with these tests (Lev 1989; Kothari 2001). *ROE* (and through some algebra *RNOA*) is an important input into valuation models (Ohlson, 1995).

$$R_t = p_0 + p_1 EARN_t + p_2 \Delta EARN_t + p_3 RNOA_t + p_4 \Delta RNOA_t + p_5 PM_t + p_6 ATO_t + p_7 \Delta PM_t + p_8 \Delta ATO_t + \varepsilon_t$$

$R_t$  = stock returns are measured using compounded buy-hold market-adjusted returns (raw return minus the corresponding value-weighted return)

$EARN_t = EPS_t / P_{t+1}$ ; earnings before extraordinary items per share in year  $t$ , deflated by the market value of equity per share at the end of fiscal year  $t+1$ ;

$\Delta EARN_t = \Delta EPS_t / P_{t+1}$ ; earnings before extraordinary items per share in year  $t$  minus its annual earnings per share in year  $t+1$ , deflated by the market value of equity per share at the end of fiscal year  $t+1$ .

$RNOA_t = \text{Net Income} / \text{Net Operating Assets}$

$\Delta RNOA_t = RNOA_t - RNOA_{t-1}$

$PM_t = \text{Net Income} / \text{Revenue}$

$ATO_t = \text{Revenue} / \text{Average Net operating Assets}$

$$\Delta ATO_t = ATO_t - ATO_{t-1}$$

$$\Delta PM_t = PM_t - PM_{t-1}$$

Equation (1) examines the *contemporaneous* relation between returns and earnings and whether the components of DuPont analysis are incrementally informative to stock market participants. However, as (Beaver, The information content of annual earnings announcements, 1968) point out, prices lead earnings because there is a richer information set impounded in stock prices *vis-à-vis* earnings. Thus, an alternative approach is to include future earnings as an independent variable.

Alpha ( $\rho_0$ ) is the fixed component of the market equity return while beta ( $\beta$ ) is the component that depicts the relationship between the stock market returns and DuPont components measures and  $\epsilon$  is the error term. The main focus was on the beta ( $\beta$ ). The regression analysis was carried out using the Stata version 12.0 that provided useful information for analysis of variance.

The study expects a strong positive relationship between earnings and stock performance as measured by the various financial ratios. The main null hypothesis tested in the study was given as follows:

H<sub>0</sub>: DuPont components are incremental to earnings and earnings changes in explaining equity returns

The nature of the relationship (i.e. whether it is positive or negative) is indicated by the sign before  $\beta$  in the equation. For example a +  $\beta$  means the relation is positive and a -  $\beta$  means the relationship is negative. The significance of the relationship is indicated by various measures such as the coefficient of determination ( $R^2$ ) and the P Value.

## CHAPTER FOUR: RESULTS AND FINDINGS

### 4.1 Introduction

The results and findings have been presented in the following regression equation in tables to see whether *RNOA* is incremental to earnings and the DuPont components are incrementally useful to earnings and *RNOA*. Tables below presents the results from the long-window association tests of Equation (1).

#### 4.1.1 Model 1

$H_0$ :  $\Delta EARN_t$  has incremental explanatory power on  $EARN_t$

$H_1$ :  $\Delta EARN_t$  does not have incremental explanatory power on  $EARN_t$

$$R_t = p_0 + p_1 EARN_t + p_2 \Delta EARN_t + \varepsilon_t$$

Returns	Coefficient	Std. Error	p> z
EARN	0.0013068	0.0005495	0.017
$\Delta$ EARN	-0.0002325	0.0005028	0.644
Constant	0.0001555	0.0001169	0.183

Table 1-Regression results for EARN &  $\Delta$  EARN

The first regression model show that  $EARN_t$  is significant in explaining returns, whereas  $\Delta EARN_t$  is not. The two tail p-value for  $\Delta EARN_t$  is  $0.64 > 0.05$  concluding that the variable has no significant influence on value 0.0067 is less than 0.05 therefore the study rejected the null hypothesis.

#### 4.1.2 Model 2

The model changes the analysis slightly to focus on different measures of profitability. Instead of just using  $EARN_t$  and  $\Delta EARN_t$ ,  $RNOA_t$  and  $\Delta RNOA_t$  are added to the analysis. Many in the valuation literature are using  $RNOA_t$  as a better measure of economic performance (Yohn, Fairfield, & Sweeney, 2001). Model 2 bears out this choice.

$$R_t = p_0 + p_1 EARN_t + p_2 \Delta EARN_t + p_3 RNOA_t + p_4 \Delta RNOA_t + \varepsilon_t$$

Returns	Coefficient	Std. Error	p> z
EARN	0.0013139	0.0005458	0.016
$\Delta$ EARN	-0.0002434	0.0005035	0.629
RNOA	0.0000172	0.0000211	0.414
$\Delta$ RNOA	0.0000224	0.0000164	0.171
Constant	0.0001478	0.000115	0.199

Table 2-Summary regression of Earn & RNOA

The results show that simply adding  $RNOA_t$  and  $\Delta RNOA_t$  increases the Chi squared value from 0.67 percent to 1.71 percent. Thus, these variables are not only incrementally significant to  $EARN$ , but also dramatically increase the traditionally low  $R^2$ s that come with this type of analysis (Lev & Thiagarajan, 1993).  $\Delta RNOA_t$  is used as a control variable.

#### 4.1.3 Model 3

$$R_t = p_0 + p_1 EARN_t + p_2 \Delta EARN_t + p_3 RNOA_t + p_4 \Delta RNOA_t + p_5 PM_t + p_6 ATO_t + \varepsilon_t$$

Returns	Coefficient	Std. Error	p> z
EARN	0.0011414	0.000543	0.036
$\Delta$ EARN	-0.0002254	0.0005015	0.653
RNOA	0.0000192	0.000021	0.359
$\Delta$ RNOA	0.0000206	0.0000163	0.206
PM	0.0002986	0.0003885	0.442
ATO	-0.000094	0.0000424	0.027
Constant	0.0002575	0.000147	0.080

Table 3-Regression results when DuPont Components are included

When  $PM_t$  and  $ATO_t$  are added to the regression in model 3, PM has a larger coefficient than ATO indicating that PM has a somewhat larger relative importance than ATO in explaining contemporaneous returns.  $ATO_t$  has a negative and significant relationship to returns which is inconsistent with prior literature different sample composition and sample periods may explain this difference. Further, it is interesting that RNOA is still significant in models 3 and 4, thus not only is PM and ATO incremental to RNOA, but RNOA appears to capture more information than is contained in its parts as well as in EARN.

There is no hypothesized reason to include level of PM since it only capture operating strategy. Nonetheless it is included in analysis to ensure comparability with prior studies.

#### 4.1.4 Model 4

$$R_t = p_0 + p_1 EARN_t + p_2 \Delta EARN_t + p_3 RNOA_t + p_4 \Delta RNOA_t + p_5 PM_t + p_6 ATO_t + p_7 \Delta PM_t + p_8 \Delta ATO_t + \varepsilon_t$$

Returns	Coefficient	Driscoll /Kraay Std. Error	p>t
EARN	0.0011418	0.0005404	0.015
Δ EARN	-0.0002223	0.0005169	0.663
RNOA	0.0000233	0.0000212	0.006
ΔRNOA	0.0000209	0.0000164	0.002
PM	0.0003405	0.0004285	0.312
ATO	-0.0001065	0.0000481	0.037
ΔPM	0.0000238	0.0004959	0.953
ΔATO	-0.0000311	0.0000508	0.523
Constant	0.0002677	0.0001562	0.416

Table 4-Summary regression results

Finally, when DuPont component changes are added in the final specification (model 4), we find that ATO, RNOA, and ΔRNOA are significant, consistent with the incremental explanatory power documented in model 3, but that ΔATO is not. Apparently, much of the strong predictive power of ΔRNOA in models 2 and 3 is driven by ATO and not PM. Table 4 highlights several findings. First, EARN is the only component that is significantly associated with contemporaneous returns consistent with the earnings prediction results. Second, the explanatory power of the return regression increases significantly with the addition of RNOA to EARN. And finally, despite the lack of change in earnings predictive ability, both PM and ATO are significant in explaining contemporaneous returns. This indicates that the DuPont components are incremental to earnings in capturing the information relevant to investors in pricing securities with high explanatory power when examining RNOA and the DuPont components.

#### 4.1.5 Diagnostic tests

Diagnostic tests	p-value
Hausman test	0.1165
Breusch –Pagan Lagrange multiplier (LM)	0.0320
Modified Wald Test	0.0000
Lagrange-Multiplier Test	0.4488
Pasaran Cross -sectional Dependence (CD)	0.0000

##### **Hausman test**

To decide between fixed or random effects the study runs a Hausman test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. It basically tests whether the unique errors ( $\epsilon_i$ ) are correlated with the regressors; the null hypothesis is that they are not. The  $\text{prob} > \chi^2$  is 0.1165 which is more than 5% therefore we fail to reject the null hypothesis therefore the suitable model is random effects.

##### **Breusch –Pagan Lagrange multiplier (LM)**

The LM test helps one to decide between a random effects regression and a simple OLS regression. The null hypothesis in the LM test is that variance across entities is zero. This is, no significant difference across units (i.e. that is no panel effect). According to the findings  $\text{prob} > \chi^2$  is 0.0320 which is less than 5% therefore we reject the null hypothesis and conclude that the random effects model is appropriate. Showing evidence of significant difference across companies.

##### **Modified Wald Test**

To test for heteroskedasticity is done on the fixed-effects model. The null hypothesis is homokedasticity. The study finds presence of heteroskedasticity therefore resort to use random effects model. To correct for this the study employs robust standard errors for panel regressions.

### **Lagrange-Multiplier Test**

The study tests for serial correlation since its presence causes standard errors of the coefficients to be smaller than they actually are and higher R-squared. The null is no serial correlation. Referring to Table 5 above we fail to reject the null and conclude the data does not have first order autocorrelation.

### **Pasaran Cross-sectional Dependence (CD) Test**

Pasaran CD test is used to test whether the residuals are correlated across entities. Cross sectional dependence can lead to bias in tests results (contemporaneous correlation). The null hypothesis is that residuals are not correlated. Table 5 shows a probability value that is less than 5% therefore we reject the null hypothesis and therefore there is evidence of cross sectional dependence. Therefore the study uses Driscoll and Kraay standard errors to correct for cross sectional dependence.

## **CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND**

### **RECOMMENDATIONS**

#### **5.1 Introduction**

The aim of this chapter is to summarize the key issues from the findings in the previous section. Please note that due to the number of companies involved in this study, part of the discussions have been done in chapter four. This chapter will also discuss the general conclusions of the study, the limitations and finally, the recommendations for further studies.

#### **5.2 Discussions**

Consistent with prior literature, neither PM nor ATO predicts future changes in RNOA. Many design differences can explain this inconsistency between this paper and (Soliman, 2008). Such as the different sample period, use of  $\Delta$ RNOA in the analysis versus  $\Delta$ EPS and the inclusion of PM in the regression which is highly correlated with the Gross Margin. Therefore despite the obvious co linearity that may exist between DuPont components and control variables, predictive power of level of ATO remains statistically significant. This supports prior literature findings and is consistent with the notion that ATO brings new information in predicting future changes in profitability and is consistent with economic intuition that innovations in ATO reflect increases in efficiency of asset usage in generating revenues. This change in firm operational efficiency does not appear to be captured by any of the accounting signals from prior literature included in the analysis.

This point to the importance of asset turnover as a useful and informative ratio on economics of the firm. In the final return test, a trading strategy is explored that exploits the information in these variables. Additionally the chance that ATO is simply measuring risk is also minimized by low increase in chi squared in Table 3 and 4 when adding DuPont components. Thus market participants do not appreciate the persistent nature of changes of asset efficiency as measured by ATO.

RNOA and PM, both are insignificant means lack of power in predicting future profitability. Likewise  $\Delta PM$  has no predictive power with respect to future changes in profitability and it also has similar time-series properties to RNOA (Nissim, 2001).

There are reasons to expect competitive forces to affect PM and ATO as sources of profitability differently. Large profit margins often draw new entrants into the market place or quick imitation of new ideas from existing rivals. The resulting competition causes high profit margins to revert to normal levels, suggesting more transitory benefits. Unlike profit margin, competition may be less threatening to an efficient deployment of assets. It is more difficult to imitate another firm's efficient production processes because such imitation often involves large and costly overhauls of current factories and operations.

Theoretical work contends that knowledge is easily diffused and transferred throughout an economy, making returns based on knowledge-based assets transitory and diminishing. In this paper, to the degree that the source of profit margin is derived from ideas that can be imitated by others, it is more likely to be transitory. Therefore consistent with the papers findings that returns derived from capital are more persistent because of the large frictions to movement of capital through an economy.

### 5.3 Conclusions

The study has provided more empirical evidence regarding equity returns and DuPont components for Nairobi Securities Exchange companies.

The study has established the nature of the relationship between stock returns and DuPont components by first deriving the Null hypothesis that was stated as follows:

$H_0$ : Equity returns do not fully reflect information in the components of DuPont analysis

The regression analysis has shown mixed relationships between equity returns and Earnings level, current levels and changes Return on Net Operating Assets, Profit Margin, Asset Turnover and change in the variables with some being positive and some negative. Majority of the companies have reported positive relationship between equity returns and all the performance indicators (except for Asset Turnover). However in the findings asset turnover is statistically significant variable to equity returns. The null hypothesis could not be rejected and therefore the study did not find a strong positive relationship between stock returns and DuPont components.

This is also supported by previous researchers who have given a major indication that most of the equity investors do not fully incorporate the accounting information in fundamental DuPont variables.

There is information contained in ATO that is not completely understood by market participants and both point to lack of appreciation of predictive abilities of ATO.

#### **5.4 Limitations of the research**

The initial objective of the study was to consider all the companies that are quoted on the Nairobi stock Exchange i.e. about 64 as at 31 December 2013(NSE Handbook, 2013). But the number was reduced to those companies that were quoted from 2007 up to 2014 which were about 50. The companies that were quoted during the period under analysis were required because of the share price that was one of the external measures of firm performance.

Another challenge was also in the process of collecting data. This is because even though Nairobi Stock Exchange companies are required to present copies of their financial statements to the various regulators, some companies do not do the same. Obtaining copies of the same proved difficult and this reduced the number of companies to be analysed. A few companies also have online financial statements and some effort had to be made in collecting the physical copies for those without online copies. Despite these challenges the financial statements for the 50 companies was still considered a good source of information for the analysis.

There are limitations also on the tool of analysis i.e. regressions. For example regression analysis has some assumptions like linearity between the dependent and independent variables. This means that the study assumes that there is a linear relationship between equity returns and information contained in DuPont components. However regression is one of the best tools to use in studying relationships among different variables. Furthermore, there was no assumption of causality i.e. high equity returns leads to better firm performance measure by DuPont components.

## 5.5 Recommendations

### 5.5.1 Importance of findings

The findings of the study are very important because of several reasons. If there is no evidence of a strong positive relationship between stock returns and DuPont components for NSE companies, therefore there is a high chance of equity investors not fully impounding the information in the DuPont components. For example in the analysis, equity returns has a strong significant relationship with asset turnover which brings new information in predicting future changes in profitability and is consistent with the economic intuition that innovations in *ATO* reflect increases in the efficiency of asset usage in generating revenues. This raises questions mainly for investors, companies and regulators.

Investors will need to consider this implication in their decision making process. Shareholders will have to be more sensitized especially on accounting fundamental signals. It will be important to determine what issues investors consider when evaluating the performance of the companies and whether they are aware of the explanatory power of DuPont components in determining future profitability.

Within companies, it is important to establish what challenges the equity analysts and even companies are faced with in coming up with future analysts forecast and whether they are really practical in the local context.

For regulators, it appears that Nairobi Securities Exchange companies are yet to implement fundamental accounting variables in equity valuation. Even though the companies use financial statements variables for equity valuation, DuPont components are not a very important consideration in determining equity valuation. It is important to find out what are the key challenges of implementing accounting based valuation schemes for equity returns so that they are addressed.

The study has also been useful for academicians and other researchers. Issues to do with equity valuation will continue to be a major area of discussion and new dimensions will arise as financial markets evolve. A major issue that arises for researchers is that there is no evidence of a relationship between stock market returns and DuPont components for NSE companies yet this is not a major source of worry for analysts and investors locally.

A question that arises is whether accounting based valuation measures for equity returns is practicable in an emerging economy or for local companies or this requirement can be applied with exceptions.

#### 5.5.2 Suggestions for further research

First because of the limitations of the study mainly the reduced number of companies, an additional research can be carried out that applies the same to all the companies of the Nairobi Securities Exchange that have provided financial statements but not necessarily been quoted during the period. Additional studies can be carried out to determine market reaction to the DuPont components and whether they are incremental to the earnings surprise. The unexpected return reaction to the earnings surprise could be examined using short window return tests. Further research can be done based on the growing evidence that market participants do not fully understand the time-series properties of earnings.

This stream of research shows that investors sometimes do not understand the future implications of current earnings mapping into future earnings and that a trading strategy exploiting this information can earn abnormal returns. To this end another series of research studies can be conducted to prove that analyst forecasts are inefficient in the sense that they do not fully incorporate past information available at the time of their forecasts. Thus suggesting that analyst's under-react to past information reflected in prices. Other studies could explore whether market anomalies can be traced to how information intermediaries such as equity analysts process accounting information.

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## **APPENDICES**

### **APPENDIX ONE: Companies under Study**

#### **(i) Agricultural sector Nature of business**

- 1 Kakuzi Coffee, tea, and fruits
- 2 Rea Vipingo Sisal Estate Sisal
- 3 Sasini Tea and Coffee Tea and coffee

#### **(ii) Commercial and Services**

- 4 Car & General Kenya Tyre retreads and machinery
- 5 CMC Holdings Motor vehicles distribution
- 6 Kenya Airways Airline
- 7 Marshalls East Africa Motor vehicles
- 8 Nation Media Group Newspaper, radio, television and courier
- 9 Standard Group Newspaper, radio and television
- 10 TPS Serena Tours Promotion Services; hotels

#### **(iii) Industrial and allied**

- 11 Athi River Mining Cement, fertilizers, minerals
- 12 Bamburi Cement Cement
- 13 BOC Kenya East African Oxygen
- 14 British American Tobacco Cigarette
- 15 Crown-Berger (Kenya) Paints
- 16 Mumias Sugar Sugar processing
- 17 EA Portland Cement Cement
- 18 East African Breweries Beer
- 19 Kenya Power and Lighting Electricity Supply
- 20 Kenya Oil Petroleum
- 21 East African Cables Cable Manufacture
- 22 Sameer Group Agribusiness, manufacturing and transport
- 23 Total Kenya Petroleum
- 24 Unga Group Flour milling

#### **(iv) Finance and Investments**

- 25 Barclays Bank of Kenya Banking and Investment
- 26 Centum Investment Company Investment
- 27 Diamond Trust Bank of Kenya Banking
- 28 Housing Finance Company Banking and Mortgage finance
- 29 Jubilee Insurance Insurance
- 30 Kenya Commercial Bank Banking
- 31 National Bank of Kenya Banking
- 32 National Industrial Credit Bank Banking
- 33 Pan Africa Insurance Insurance
- 34 Standard Chartered Bank Banking

#### **(B) ALTERNATIVE INVESTMENT MARKET**

- 35 Express Kenya Logistics
- 36 Kapchorua Tea Tea
- 37 Williamson Tea Kenya Tea