THE EFFECT OF GROWTH OF EARNINGS AND STOCK PRICES ON THE PRICE - EARNINGS RATIO OF FIRMS LISTED AT THE NAIROBI SECURITIES EXCHANGE

BY

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DECLARATION

I declare that this is my original work and has never been presented in any other college or examination body.

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APPROVAL

This project has been submitted for review with my approval as University Supervisor.

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DEDICATION

I dedicate this work to the University of Nairobi and to my family for their invaluable support and patience during this study, and to my daughter, Mary Deborah Langri, whose constant reality check and mirthful reminders made this work a joy even during its darkest hours.

ABSTRACT

The objective of the study was to establish the effect of the growth of earnings and the growth of stock prices on the price earnings ratio of companies listed at the Nairobi Securities Exchange (NSE). The study adopted a descriptive survey design. It involved a census survey of all the companies listed at the NSE during the years 2003 – 2012. These were subdivided into 10 subsets corresponding to the 10 sectors of the Exchange. Secondary data was obtained from the NSE Handbooks covering the periods 2002 – 2006, 2003 – 2007 and 2008 – 2012 which provided 5-Year company financial performance summaries. The data collected was summarized into yearly weighted averages for the test variables for the NSE for the years 2003 – 2012. This summary data was then analyzed using descriptive statistics. Multivariate correlation and regression analyses were used to test the relationship between the price earnings ratio and the growth of earnings and stock prices. The study found that there existed a moderate but positive association between the price earnings ratio and the growth of stock prices, but an insignificant relationship between the price earnings ratio and the growth of earnings. However, it found a moderate to strong positive association between the growth in the price earnings ratio and the growth in stock prices, and a moderate and negative association between the growth in price earnings ratio and the weighted average annual riskless rate (the 91-day T-Bill rate). The association between the growth in price earnings ratio and the growth in earnings was not insignificant. The study found that these associations were more pronounced for shorter periods, i.e. 2003 – 2007 and 2008 – 2012, than for the entire 10 year period, and more pronounced for 2008 – 20012 than for 2003 – 2007.The study concluded that the associations determined for the NSE reflected similar empirical studies of other exchanges, and they also suggested a an efficient market in the weak form, with growth rather than value shares dominating the exchange. The study recommends reform of the NSE to move it to an efficient market in the semi-strong to strong form. It also suggests that further research be undertaken using more refined data to authenticate these findings.

Key words: price earnings ratio, stock prices, earnings, riskless rate.

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ABBREVIATIONS

AEG	-	Abnormal Earnings Growth Model
CAPM	-	Capital Assets Pricing Model
CMA	-	Capital Markets Authority
DPS	-	Dividends Per Share
E/P	-	Earnings to Price Ratio
EPS	-	Earnings Per Share
LTG	-	Long Term Growth
MPPS	-	Market Price Per Share
NSE	-	Nairobi Securities Exchange
P/E	-	Price to Earnings Ratio
PEG	-	Price Earnings to Growth Ratio
PERG	-	Price to Earnings Ratio adjusted for Risk and Growth
PX	-	Prague Stock Exchange
RIV	-	Residual Income Valuation Model
S&P 500	-	Standard & Poor 500 Index
UK	-	United Kingdom of Great Britain and Northern Ireland
USA	-	United States of America

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Financial markets and investment analysts consider the price-earnings ratio as an invaluable investment tool and guide to company performance. Research indicates that this ratio is strongly influenced by a firm's earnings and stock performance.

1.1.1 Price Earnings Ratio

The price-to-earnings ratio (p/e) is a widely used valuation multiple and guide to relative values of companies (Vorek, 2009). The p/e is defined mathematically as market price per share divided by annual earnings per share. There are two main types of p/e ratios: the trailing p/e and the forward p/e, based on the nature of the denominator, whether earnings per share is actual earnings over the past one year (trailing p/e) or forecast earnings over the next one year (forward p/e). Variations to these standard p/e ratios reflect the nature of earnings making up the denominator, i.e. earnings per share (Estrada, 2003). Trailing p/e for continued operations uses income from operations, which excludes income from extraordinary items, discontinued operations, and accounting changes. Earnings may also be rolling averages over several years, so that cyclical or otherwise volatile earnings are smoothened. Long term p/e data usually uses net income available to ordinary stock holders. Earnings per share may also be basic, primary or fully diluted.

The p/e ratio reflects the price that the market is willing to pay for a shilling of earnings of the share (Estrada, 2003). Ceteris peribus, the higher the p/e, the more attractive the share. Generally, an increasing p/e ratio means that the company's earnings are growing, or the market is certain of higher growth rate of earnings for the

company, if shares outstanding are unchanged. The converse is true. In general, p/e growth (decline) may represent a mismatch between rates of growth (decline) of stock price and EPS, which in turn may be driven by analysts' different expectations of the company's future. Also, p/e is positively driven by future growth opportunities, and negatively by the discount rate demanded by investors, which is related to the market interest rate. Thus, companies with good growth opportunities should have high p/e; those with poor growth opportunities should have low p/e. Also, if the riskless rate is the discount rate, the higher the return on government securities, the lower the p/e.

1.1.2 Growth of Earnings

The value of the firm is a function of its sustainable growth rate and its discount rate, (Modigliani and Miller, 1961). Since the increase in earnings is a function of both the retained earnings and the return on retained earnings, a simple way to estimate the firm's growth rate is to multiply the retention ratio with the expected return on the retained earnings. The growth of earnings is equal to the growth in dividends in this context because the ratio of dividends to earnings, the payout ratio, is held constant. From the dividend growth model, the growth rate of earnings is a function of the firm's required rate of return and the dividend yield (Estrada, 2003). Thus, the growth rate is positively correlated with the discount rate and negatively correlated with dividend payout. This is plausible: dividends reduce retention ratio and therefore lower the overall return on retained earnings, thus reducing the growth rate. On the other hand, the higher the required rate of return, the higher the expected return on retained earnings, and the higher the earnings growth rate. It also suggests a positive relationship between the p/e ratio and the earnings growth rate, and an inverse relationship between the p/e ratio and the firm's required rate of return.

Investors buy future earnings, and therefore should pay less for current earnings if those earnings are unsustainable in the future (Penman and Zhang 2006). Analysts are interested in the sustainable component of earnings because they understand that equity values are based on expected future earnings rather than current earnings. Accordingly, investors should pay less for current earnings if those earnings are not sustainable; if earnings are temporarily high, and are expected to decline in the future, p/e ratios should be lower than if the earnings were sustainable. Correspondingly, if earnings are temporarily depressed, so are expected to increase, p/e ratios should be higher than if those earnings were to be sustained at their current level.

1.1.3 Growth of Stock Prices

Shareholders receive cash in one of two ways or both: when dividends are paid, or when the shares are sold to other investors in the market. The price of a share is therefore the present value of these expected cash flows (Penman and Sougiannis, 1995). Over the long term, the price today of the share is the present value of all expected future dividends. In estimating future dividend flows, investors consider three possible scenarios: zero growth of dividend (constant dividends in perpetuity), constant growth (dividends growing at an overall constant rate), or supernormal growth (dividend growth is not consistent initially, but eventually settles down to a constant rate). Thus, when we control for risk, stock prices are sensitive to dividend growth and dividend policy.

Using the growth models, the stock price is positively correlated with the dividend growth rate, and experiences a dramatic increase when the dividend growth rate approaches the required rate of return, but is undefined for the case when the growth rate matches the discount rate / required rate of return (Beaver and Morse, 1978).

Stock prices are also sensitive to the required rate of return. Thus, stock prices will grow with growth in dividends / earnings but decrease with an increase in the discount rate, reflecting a growth premium when earnings growth exceeds the discount rate, or a growth discount when dividends / earnings grow slower than the required rate of return. It is not expected that the dividend growth rate would surpass the required rate of return, since over the long term, it is not plausible that the firm would consistently invest in projects whose returns always exceeded the required rate of return.

1.1.4 P/E Ratio, Growth of Earnings and Growth of Stock Prices

Beaver and Morse (1978) note that under perfect markets and certainty, the price of a security is equal to the present value of its future cash flows. Over an infinite horizon, the current price will thus be the present value of the dividend stream. Under further assumptions of (1) a constant dividend payout ratio, (2) a constant rate of growth in earnings per share, and (3) a constant riskless rate, the p/e ratio is given by the payout ratio discounted by the growth premium or discount. When the stock price grows faster than earnings per share, the p/e ratio increases. Generally, there is a positive correlation between the stock price and p/e and an inverse relationship between the p/e ratio and the riskless rate or firm's required rate of return. If there was no growth in earnings, p/e would have a direct inverse relationship with the riskless rate, with payout ratio as the slope of the line (Fuentes and Daza, 1996). The effect of the growth of earnings mitigates the severity of this relationship. When the rate of return exceeds (or falls below) the riskless rate, the p/e ratio reflects a growth 'premium' ('discount').

In a certain world, earnings per share can be defined as that constant cash flow whose present value is equivalent to the present value of cash flows generated from the

current equity investment. Where the investment is in assets with finite lives, this definition implicitly recognizes that the value of the assets will depreciate over their useful lives. This concept is referred to as permanent earnings. If there are no further investments, or if the earnings rate on the further investment is the same as the riskless rate, the p/e ratio is simply the reciprocal of the riskless rate. With uncertainty, earnings per share is not directly observable but represents some form of expected permanent earnings per share attributable to the current equity investment (Beaver and Morse, 1978). Similarly, the payout ratio, the riskless rate and the growth rate are unknown but represent the expected value of the corresponding variable. The expected return is no longer a riskless rate but rather a risky rate. Therefore actual earnings may differ from expected earnings upon which market prices are based.

1.1.5 P/E Ratio and Growth of Earnings and Stock Prices at the NSE

Stock market performance in Kenya is tracked by four key indices of the Nairobi Securities Exchange (NSE): the NSE 20 Share Index, the NSE All Share Index, the FTSE NSE Kenya 15 Index and the FTSE NSE 25 Index. The NSE 20 Share Index, the benchmark index of the NSE, is a price-weighted index, is the oldest and was launched in 1966. The performance of a benchmark stock market index like the NSE 20 Share Index generally reflects the performance of the whole market. Between 1966 when the index was launched and 2012, the NSE 20 Share Index has risen 4,500 points, reflecting an overall robust growth in prices and earnings. P/e ratios at the NSE have risen with rising prices, where the growth in prices has been faster than the growth in EPS. One study hints that the NSE 20 Share Index, being a geometric index, is independent of the base date but has consistently understated stock price rises and consistently overstated stock price falls (Odera, Otieno, Kieran and Jaafar, 2012), raising doubts about its representativeness of the NSE.

1.2 Research Problem

From the discounted cash flow model for equity valuation, assuming constant dividend growth, the p/e ratio is equal to the payout ratio (adjusted for dividend growth) discounted by the growth premium (discount). Thus, other things held equal, higher growth firms will have higher p/e ratios than lower growth firms; higher risk firms will have lower p/e ratios than lower risk firms; firms with lower reinvestment needs will have higher p/e ratios than firms with higher reinvestment needs; we note however that higher growth firms tend to have risk and high reinvestment rates. Investment practice as well as an elementary model like the constant growth model suggest that the forward p/e ratio depends on expected growth and risk. Thus, if investors' growth expectations are rational, a positive correlation should be observed between the forward p/e ratio and subsequent realized growth in earnings and stock prices, holding risk constant.

The p/e effect has been widely documented since Nicholson (1960) showed that companies having low p/e ratios on average subsequently yield higher returns than companies having high p/e ratios, and this difference is known as the value premium. Anderson and Brooks (2005) noted that many value / contrarian fund managers use a low p/e ratio as an indicator of the desirability of a particular stock for investment. This p/e effect was also covered extensively by Dreman (1998). Similarly, Peavy and Goodman (1983) showed that stocks with a low p/e ratio give, on average, a higher return than those with a high p/e ratio, for stocks with the same CAPM beta models. Capaul, Rowley and Sharpe (1993) found that value strategies outperformed growth strategies in the US, Europe and Japan in the period 1981– 1992. Although not observed in every country or every year, Bauman, Conover and Miller (1998) report

similar results for 21 countries over the period 1985–1996. Some studies show only partial or non-linear relationships between the p/e ratio and growth of earnings and stock prices, e.g. Campbell and Shiller (1998), Wu (2009) and Shen (2001).

In Kenya, Muchiri (2012) studied the impact of macro-economic variables on the performance of the NSE, concluding that interest rates had a negative but insignificant effect on share prices. Njenga (2013) found that the risk free rate (91-day T-bill rate), market to book ratio and market return all had a positive and significant relationship with stock returns for a firm at the NSE. Were (2012), found that the portfolio with the highest beta also had the highest return and the portfolio with the lowest beta also had the lowest return: higher risks were associated with higher returns thus validating the CAPM principle for the NSE, echoing findings by Abdalla (2012). Anyumba (2010) used an empirical test of the Random Walk model for the NSE and classified it as an efficient market in the weak form while Nyagaka (2012) found a weak but positive relationship between dividend payout ratio and market value. A study by Waweru, Pokhariyal and Mwaura (2012) provided further empirical evidence that dividends are used as signals about future earnings prospects of the firm.

Clearly, there exist relationships between the p/e ratio, stock prices, and earnings growth in stock exchanges. Most studies that have examined the relationship between the p/e ratio and growth of earnings for quoted companies have concentrated on the forward p/e ratio, mainly because today's share price reflects investors' expectations of future earnings from an investment in the stock. However, studies on whether there indeed exists a discernible relationship between ex-post growth of earnings and prices and the trailing p/e ratio are few. This study seeks to address this research gap, and provide a basis for more substantive research on this topic by other scholars. Our question, given the substantial evidence of positive correlation between the forward

p/e ratio and growth of earnings and stock prices, is this: Among ex-post financial data, does there exist a relationship between the observed p/e ratio and the observed growth in earnings and stock prices? What is the evidence for the Nairobi Securities Exchange (NSE)?

1.3 Research Objective

The objective of the study was to establish the relationship between the trailing price earnings ratio and the growth of earnings and stock prices for firms listed at the Nairobi Securities Exchange.

1.4 Value of the Study

The study sought to provide empirical evidence of relationships between the p/e ratio and earnings and stock prices at the NSE. It would add to the body of research on NSE's market efficiency in pricing earnings. The results of this study would also be important to several key stakeholders of the Nairobi Securities Exchange. Securities market parameters such as indices are recognised as leading indicators of economic activity, and the level of stock prices can also have a direct impact on consumption through the wealth effect. The results of the study should help policy makers, e.g. CMA, formulate guidelines and regulations that help in moving the NSE towards market efficiency where the significant market information available is incorporated in prices of securities, so that such prices substantially reflect the actual state of the market.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section covers a review of modern theory and research on the link between the p/e ratio and the growth of earnings and stock price of the firm. Section 1 introduces the chapter; section 2 reviews the main theories in use for determination of stock prices and the p/e ratio; section 3 examines the significant research work in this area to date, and section 4 presents a summary of the literature review.

2.2 Review of Theories

2.2.1 Net Present Value of Growth Opportunities Model

Vorek (2009) offers a simplified stock valuation model that combines the present values of the firm's expected earnings per share and its future growth opportunities. Thus the market price of the stock is the sum of the discounted expected earnings per share plus the net present value of future growth opportunities for the firm. The discount rate is the firm's required rate of return. In other words, the price of a share of stock can be viewed as the sum of two different items. The first term is the value of the firm if it distributed all its earnings to shareholders. The second term is the additional value if the firm retains earnings to fund new projects. Two conditions must be met in order to increase value: firstly, earnings must be retained so that projects can be funded; secondly, the projects must have positive net present value (NPV). Thus, from this model, the p/e ratio is related to the net present value of growth opportunities.

Generally, the stock of the firm with growth opportunities should sell higher than that of one without. This explanation seems to hold fairly well in the real world. For example, electronic and other high tech stocks (Apple Inc., Samsung Electronics Ltd) generally sell at very high p/e multiples (ratios) because they are perceived to have high growth rates, with some tech stocks selling at high prices even though the companies have never made a profit. Conversely, utilities, rail, and steel companies sell at lower multiples because of the prospects of lower growth. The stock market, of course, is merely pricing perceptions of the future. The model holds that the p/e ratio is negatively related to the firm's discount rate and the stock's risk.

2.2.2 Residual Income Growth Models

Preinreich (1938) provided a residual income valuation model for the price of equity, while Fairfield (1994) derives a general relation for trailing e/p ratios using growth in residual income (or change in expected residual income. Preinreich (1938) model highlights the intuitive links between the p/e ratios and earnings risk / growth derived from Gordon's (1962) dividend growth model: p/e ratios are positively related to growth and negatively related to equity discount rates. Fairfield (1994) improves on those intuitive links by providing clarification on how those measures should be calculated: first, the p/e ratio should be calculated cum-dividend not ex-dividend. Second, growth should be measured not as growth in dividends or earnings, but growth in residual income. Finally, that growth in residual income is scaled by current earnings and discounted.

While Fairfield's (1994) derivation of a general relation for trailing e/p ratios describes p/e ratios by growth in residual earnings, a parallel relation derived by Ohlson and Juettner-Neuroth (2004) can be used to describe p/e ratios by adjusted growth in earnings per share. It's simplest form describes forward p/e ratios as the

reciprocal of the growth discount, which when inverted provides the desired linear separable relation for forward e/p ratios. Similarly, it can be shown that, for trailing p/e ratios, this reduces to the reciprocal of the growth discount adjusted for required rate of return; a simpler relation for trailing p/e ratios, derived by assuming that this adjustment is approximately equal to 1, is given by the reciprocal of the growth discount. Two assumptions are made to generate these simple linear relations that link p/e ratios to observable proxies for risk and growth: (i) future earnings grow at a constant rate, and (ii) expected earnings on prior year's retained earnings are small relative to the first difference in earnings.

2.2.3 Equity Valuation Models

Equity valuation models, e.g. the RIV model by Ohlson (1995) and AEG model by Ohlson and Juettner-Nauroth (2005) recognize that theoretically the p/e ratio is a function of the firm's cost of capital, its short-term earnings growth rate, as well as its long-term earnings growth rate. Since the price of the stock is a reflection of the market's expectation of the firm's future earnings, the relevant p/e is the forward p/e ratio. Thus, the price of the equity is equal to its capitalized future earnings adjusted for subsequent superior or abnormal growth in expected earnings. This future abnormal growth in expected earnings can be split into two parts: a near-term or short-term constant earnings growth rate and an asymptotic, or perpetually growing, future earnings growth rate (He, 2012). Using estimation methods developed by Easton (2004) to approximate these variables, one can build a linear regression model to link p/e ratio and the other variables by applying multivariate regression method.

Dividend growth models equate the price of equity to the discounted value of its future cash flows. Over an infinite horizon, the current price will thus be the present value of the dividend stream. Under certain assumptions it can be shown that the p/e

ratio is given by the Gordon-Shapiro valuation equation which discounts the constant dividend payout ratio, with the growth discount (the difference between the constant riskless rate and constant rate of growth in earnings per share).

2.3 Review of Empirical Studies

Gordon (1962) and Fairfield (1994) made intuitive and formal analyses of factors that determine p/e ratios and predicted a positive relation between p/e ratio and expected growth and a negative relation with expected rates of return, which in turn imply a negative relation with risk and nominal interest rates. Other empirical studies (Beaver and Morse, 1978; Penman, 1996) showed only weak links between p/e ratios and risk / growth, especially at the firm level. Beaver and Morse (1978) considered the behaviour of portfolios formed on trailing e/p over the period 1956 to 1974. Although they found that e/p ratios persisted over time, observed long-term growth and risk measures explained little variation in e/p, even at the portfolio level, concluding that persistent e/p differences are likely due to persistent differences in accounting methods and estimates, rather than differences in growth and risk. Chowdhry and Titman (2001) found a negative association between real interest rates and trailing p/e in a small, open economy.

Penman (1996) re-examined the Beaver and Morse (1978) conclusion regarding the low correlation between p/e ratios and observed long-term growth and found a stronger relation using a more recent sample period (1968-1985) and a measure of earnings growth that corrects for 7 dividends paid. Whereas the correlation between portfolio-level p/e ratios and observed growth in Beaver and Morse (1978) declines substantially after the second year, Penman's results show higher correlations even nine years later. Zarowin (1990) examined a smaller sample of 175 firms with analyst

forecast data over the 1961 to 1969 period and concluded that using forecasted long-term growth rather than observed long-term growth alters the conclusions of Beaver and Morse (1978), i.e. he found that cross-sectional variation in portfolio-level trailing e/p is indeed significantly linked to forecasted long-term growth in earnings.

Campbell and Shiller (1998) examined the historical relationship between the decline in market p/e ratio to its long-term average and the nature of the growth in market prices of stocks and underlying earnings. Using the S&P 500 index for the years 1880 to 1989, they calculated three measures for each year: the p/e ratio of the S&P index at the beginning of the year, the annualized changes in real stock prices over the next 10 years and the annualized changes in real earnings over the next 10 years. The measure of earnings (the denominator) used in the p/e ratio was the average of realized earnings over the previous ten years, whilst stock prices (the numerator) were measured in real terms because what matters to investors is the purchasing power of their investment.

Campbell and Shiller (1998) found that higher p/e ratios are usually followed by lower stock price growth during the following decade, and that higher p/e ratios are usually *not* followed by faster earnings growth, implying that there was no systematic relationship between the p/e ratio and subsequent growth in long-term earnings. As a check on these results, they calculated the statistical correlation over the period between the p/e ratio and subsequent growth in stock prices and earnings, and found that the p/e ratio was negatively correlated with subsequent stock price growth but uncorrelated with subsequent earnings growth. The negative correlation between the p/e ratio and subsequent stock price growth was statistically significant, in the sense that the probability that this correlation was due to pure chance was very small. Thus, the statistical results tended to confirm their conclusion that movements in the p/e

ratio back toward the long-term average had occurred mainly through changes in stock price growth rather than changes in earnings growth.

Vorek (2009) noted that researchers, using ex post data, had found that comparisons of historical yields of stock with their p/e ratios yielded a negative correlation between a stock's yield and its level of p/e ratio, and that investment in stocks with low p/e ratios achieved higher than average results. Using this as a basis, he examined whether the reverse relationship would hold: did higher p/e ratios predict a fall in stock prices? He reviewed data from S&P 500 stock index and the PX (Czech) stock index for the period march 2005 to march 2009, and also the behaviour of S&P stock index in the years between 1964 and 2009. His conclusion was that there was no clear role of the p/e ratio as a predictor of a fall in stock prices, especially over the long term (5 years and beyond). Over the short term, (1-3 years) markets tended to push the p/e ratio back to its short-term average whenever there were significant deviations from that average.

Wu (2009) examined the association between the forward p/e ratio and subsequent realized growth and found a non-linear relationship between the forward p/e and subsequent realized growth, whether risk was held constant or not. His findings suggested that firms with high forward p/e were more likely to report losses and had higher volatility of earnings than those with low forward p/e, and suggested a U-shaped relationship between high p/e and volatility of earnings at the portfolio level. This was different from findings by Thomas and Zhang (2006), who found a weak positive relationship between forward p/e and observed growth, and a strong positive relationship between the forward p/e and expected growth at the firm level.

He (2012) examined the relationship between the firm's forward p/e ratio and the expected earnings growth rate under the theoretical model of Ohlson and Nauroth (2005), and found a positive correlation between the p/e ratio and the firm's short-term expected earnings growth rate, after controlling for cost of capital. His empirical tests showed that for firms with the same cost of capital and short-term expected earnings growth rate, the higher the long-term abnormal earnings growth rate, the higher the p/e ratio. Also, for firms with the short-term expected earnings growth rate close or equal to the cost of capital, the positive relationship between the p/e ratio and the short-term expected growth rate is reversed and becomes negative, consistent with the theoretical model of Ohlson and Nauroth (2005). He found that there exists a significant and negative relationship between the p/e ratio and the firm's cost of capital.

Zhang and Thomas (2006), seeking to further recent research by looking at the effect of new measures of determinants of p/e ratios, such as analyst forecast data, additional measures of risk like volatility of reported earnings, p/b ratio and market cap, found that on a market aggregate level, there exists a strong negative link between forward p/e ratios and prevailing interest rates, with only a weak negative link between trailing p/e ratios and prevailing interest rates. At the firm level, however, that relationship is reversed: there is a strong positive relationship between the forward p/e ratios and prevailing interest rates (as predicted by theory) with an unexpected negative relationship between trailing p/e ratios and prevailing interest rates. Also, at the firm level, by regressing e/p ratios on interest rates, observed future growth and two traditional measures of risk (market model betas and standard deviation of returns), they found that contrary to theory and intuition, p/e ratios are positively related to risk, with a weak positive relation to observed growth.

Using forecast growth rather than observed growth however reversed the association for risk (from positive to negative relationship with p/e) and improved dramatically the positive relationship with growth. Zhang and Thomas (2006) postulate that it appears that observed growth measures expected growth with an error that is systematically biased, and that measurement error is correlated with risk. They also found that introducing newer measures of risk, such as p/b ratio and market cap, does not change the overall tenor of observed results. Estrada (2003) noted that the PEG ratio, now a popular valuation tool among analysts, improved upon the p/e ratio by adjusting the p/e ratio by growth and proposed a new tool, the PERG ratio, which adjusts the p/e ratio by both risk and growth (i.e. price to expected earnings adjusted for risk and growth). His tests showed that PERG – based value strategies outperform value strategies based on p/e and PEG ratios on a risk-adjusted basis.

In Kenya, a study by Njenga (2013), about factors affecting stock market returns at the NSE, used stock returns on shares comprising the NSE 20-share index regressed against various variables found that the risk free rate (91-day T-bill rate), inflation rate, market to book ratio, and market return all had a positive and significant relationship with stock returns for individual company. Muchiri (2012), in a similar study of the NSE, concluded that interest rates had a negative but insignificant effect on share prices, while inflation and money supply had a positive but insignificant effect on share prices. Were (2012), testing the CAPM on weekly returns at the NSE, used the NSE weekly data from 2005 to 2012 for companies comprising the NSE 20-share index, and found that the portfolio with the highest beta also had the highest return and the portfolio with the lowest beta also had the lowest return: higher risks were associated with higher returns thus validating the CAPM principle.

Abdalla (2012), also tested the validity of modern portfolio theory on the NSE and found that an optimal portfolio can outperform the NSE 20-share index. Anyumba (2010) used an empirical test of the Random Walk model for the NSE to determine if the NSE indices followed a random walk model or not, in order to determine if the NSE conformed to efficient market hypothesis. Using data from 2004 to 2009 for the NSE 20-share index companies, the study found that the NSE indeed followed a random walk model, i.e. prediction of share prices was difficult using past data, and classified the NSE as an efficient market in the weak form. Nyagaka (2012), examined the dividend payout ratio and market values of firms listed at the NSE between 2004 and 2011 and found a weak but positive relationship between the dividend payout ratio and market value. Waweru, Pokhariyal and Mwaura (2012) provided further empirical evidence that dividends are used as signals about future earnings prospects of the firm.

2.4 Summary of Literature Review

Clearly, the bulk of research work confirm a strong positive correlation between the forward p/e ratio and growth of expected earnings, both at the firm and portfolio levels. This positive relation is especially strong over the short term, but weakens over the long-term. This relationship is weak when the association is between forward p/e ratios and observed future growth. Also, at the market level, there exists a strong negative relationship between the forward p/e and interest rates, but this relationship reverses to a strong positive association at the firm level. Also, at the firm level, using observed growth, the forward p/e ratio is positively related to risk, but this is negative when forecast growth is used.

However, there appears to be a weak or no systematic relationship between the trailing p/e ratio and subsequent observed long-term growth in earnings, but that there exists a negative relationship between the trailing p/e ratio and growth of stock prices over the long-term, confirming the existence of the value premium. These observations seem to hold at both the firm and the portfolio levels. At the market aggregate level, there exists a weak negative link between trailing p/e and prevailing interest rates, but this relationship is unexpectedly negative at the firm level. Also, at the firm level, the trailing p/e is positively related to risk when observed growth is used, but is negatively related to risk when projected growth is used.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter lays out the manner the research was carried out. Section 1 introduces the chapter; section 2 discusses the manner the research was designed, section 3 states the target population, section 4 explains how the data was collected and section 5 lays out the manner this data was analysed, including the analytical model. Section 6 rounds off the chapter with a discussion on data validity and reliability.

3.2 Research Design

This was an empirical study of the effect on the p/e ratio of the growth of earnings and stock prices for firms listed at the NSE during the years 2003 to 2012. The study adopted a census survey research design and involved collecting relevant data from the NSE in order to answer questions concerning the study. The study obtained data from the NSE Year Books (also called NSE Handbooks) covering the period 2003 to 2012. The Year Books provide financial performance information for 5 year periods for firms listed at the NSE. Using this data, year – on – year growth of earnings and stock prices was calculated for each of the firms listed during the period covered by the study, as well as the p/e ratio at beginning and close of the year. The study also calculated the growth in the p/e ratio in each year for each listed firm.

Using the number of outstanding shares for the firm at the end of the year as the weight, the weighted averages for the p/e ratio, growth in stock prices, growth in earnings, and growth in p/e ratio, were calculated for the NSE for each of the years 2003 to 2012, as well as for each of the 10 sectors of the NSE. The results thus

obtained were fitted to a multivariate regression model to determine what effect the two variables had on the p/e ratio during the study period. A third variable, the riskless rate, was introduced to measure the effect of risk. A multivariate regression model was justifiable because it examined the relationship between multiple quantitative variables in the population on a cause – effect basis. The study used relevant financial information of all the firms listed at the Nairobi Securities Exchange during the last 10 years to obtain required data to be fitted to the quantitative variables.

3.3 Target Population

The target population for the study were all the 67 firms listed at the Nairobi Securities Exchange for any year during the period covered by the study. Thus, this was a complete census survey of all listed firms in years 2003 to 2012.

3.4 Data Collection

This study used secondary data from the Nairobi Securities Exchange 5 – Year Final Handbooks that provided listed-company financial performance information for 5-year periods, i.e. years 2002 – 2006, 2003 – 2007 and 2008 – 2012. All the data used in the study was sourced from these three NSE Final Handbooks. Data was not always available for each company for all of the years 2003 – 2012. Some companies, already listed at the NSE as at beginning of year 2003, were delisted at some point in the period covered by the study. Others achieved listing at other points in the period covered by the study. For such companies, relevant data was missing for the years they were not listed at the NSE. Data was transferred from these NSE Handbooks to suitable excel spreadsheets for analysis.

3.5 Data Analysis

Earnings per share is dependent on net earnings available to shareholders and the number of shares issued. Market price per share, on the other hand, is theoretically dependent on the present value of expected net cash flows from the stock (dividend stream and any capital gains), but in practice is set by market forces of demand and supply, which may or may not incorporate the entirety of the present value of theoretical cash flows expected from the stock, largely because estimating this cash flow is a difficult process based on uncertain future outcomes. Markets thus rely on various factors affecting the demand and supply of stocks to set share prices. Among such factors are the following: past and expected growth in net income, dividends, and share prices; the stock's liquidity and risks associated with the stock.

Thus, if P = market price per share, then:

$P = f$(growth of earnings and dividends, growth of share price, risks of the stock).

If E = EPS, then E = f(growth of earnings, number of shares outstanding).

Theoretically then,

$$P_i/E_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$$

Where:

P_i/E_i *is the p/e ratio at close of year i,*

β *terms are parameters of the regression model, and are to be determined;*

g_i *is earnings growth rate for the firm in year i; as % growth over year(i-1).*

ρ_i *is the stock price growth rate for the firm in year i; as % growth over year (i-1).*

θ_i *is the average annual riskless rate in year i; i.e. the average 91-day T-bill rate;*

ε *is the disturbance term.*

The data was analyzed through descriptive statistics. Multivariate analysis of the regression model above was used to test the statistical significance of the relationships between the quantitative variables with the p/e as the dependent variable and its supposed determinants being the independent variables using historical quantitative data from the NSE over the period 2003-2012.This quantitative data was analyzed using the Excel software's standard statistical packages / models for multivariate regression and correlation analyses.

Data was analyzed using descriptive statistics like measures of central tendency (mean), and dispersion (variance, standard deviation) for each of the quantitative variables measured. The objective was to obtain key descriptive statistics for the population – i.e. the firms listed at the NSE. The data used was based on actual trading results and findings are therefore valid for the NSE for the period studied.

3.6 Data Reliability and Validity

Data reliability and validity are concerned with the degree to which research findings can be applied to the real world, beyond the controlled setting of the research. This study used data for the entire population of 67 firms listed at the NSE at one point or another during the years 2003 – 2012 to test the quantitative relationships envisaged by the analytical model above. The results are thus representative of the entire NSE for that period, giving good conclusive validity. The analytical model combines features of the dividend growth model, the equity valuation model and the net present

value of growth opportunities model in valuation of stock, so that construct validity is reliable.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter lays out the method used to analyse the data collected for this study and the results obtained from that analysis. It also discusses the nature and meaning of these results. Section 2 explains the methods employed in the analysis, and sets out the results from the analysis, while section 3 discusses those results.

4.2 Data Presentation and Analysis

The study developed several excel spreadsheets to capture for each listed company the data required to determine the envisaged relationship between the dependent variable P_i/E_i (p/e ratio, or its variants) and the independent variables g_i (which is the growth of annual earnings from one year to the next), ρ_i (which is the growth of the closing stock price from one year to the next), and finally, θ_i (that year's market riskless rate, determined as the average 91-Day T-Bill Rate for the year).

As a starting point, the study created a master spreadsheet (master 1) divided into 13 sections. One section contained a column of the listed companies grouped by sector. These were 67 companies classified into 10 sectors. The next section contained a column for the date of the financial year end of each company. This section was followed by that containing a column for the general date of the closing share price for each company. These 3 sections were followed by 10 other sections, one for each of the years 2003 to 2012.

Finally, each year's section had 13 columns, which tabulated, for each company, the market price per share (mpps) at close of the financial year, earnings for the year, earnings per share for the year, the p/e ratio at close of the year, and the growth and weighted growths for each of these quantities. There was also a column for the outstanding ordinary shares of the company at close of the year. The growths in market price per share (mpps) and in earnings for the year as well as the p/e ratio were weighted by the number of outstanding shares to obtain the weighted growths. Earnings per share data was used to check accuracies of the p/e ratios and growth in earnings. This is a bulky document and can be accessed at www.odiero.blogspot.com

The master spreadsheet was used to calculate, for the entire NSE for each year, the average weighted growth in market price per share, average weighted growth in earnings, and the average weighted p/e ratio and the average weighted growth in the p/e ratio. A similar table, master 2, was used to calculate similar quantities but now for each of the 10 sectors of the NSE instead of the entire NSE. Weighted average figures were transferred from these tables to Table N1 (NSE 1) with weighted average results for the entire NSE for years 2003 to 2012, and tables N2 (NSE 2) with weighted average results for years 2003 to 2007, and N3 (NSE 3) with weighted average results for years 2008 to 2012. Note that N2 and N3 are subsets of N1.

Table N1is reproduced below. It provides summary data for each of the variables in the analytical model. These are weighted averages for the NSE for each variable for each year. Note also that the variables retain the symbols in the analytical model above except the weighted average p/e ratio, now represented by Y_i, and the weighted average growth in the p/e ratio, as an alternative to Y_i, and represented by G_i.

TABLE N1 – ALL NSE SUMMARY DATA : 2003 - 2012 FOR ALL LISTED COMPANIES

(WEIGHTED ANNUAL AVERAGES OF PER SHARE DATA, EARNINGS AND T-BILL RATES)

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	12.74	1.57	1.46	(0.56)	0.04
2004	11.88	1.11	0.39	1.81	0.03
2005	41.51	2.65	0.48	0.40	0.08
2006	6.81	(0.23)	0.49	0.40	0.07
2007	(3.64)	(0.50)	(0.32)	0.32	0.07
2008	12.86	(0.19)	(0.19)	0.67	0.08
2009	11.86	0.04	(0.23)	(0.15)	0.07
2010	12.59	0.23	0.70	0.57	0.04
2011	9.08	(0.30)	(0.35)	0.01	0.09
2012	8.92	(0.01)	0.07	0.05	0.13

Data from this table is used below to determine relationships, if any, between, in the first instance, Y_i and ρ_i, g_i, and θ_i and, in the second instance, G_i and ρ_i, g_i, and θ_i, for the years 2003 to 2012. The data was analysed using Microsoft Excel's embedded software for multivariate correlation and regression analysis. One key test statistic examined was the magnitude and direction of correlation between the dependent variable (Y_i or G_i) and each of the independent variables (ρ_i, g_i and θ_i). The sign of the correlation coefficient determines the direction of the correlation while the magnitude of the coefficient determines the strength of that correlation. A coefficient between 0 and 0.3 indicates a weak or non-existent correlation; a coefficient between 0.3 and 0.7 indicates a moderate correlation; while a coefficient above 0.7 indicates a strong correlation. The correlation coefficient will always lie between -1 and 1.

Another key statistic examined was the level of confidence at which the regression model was significant. The regression program determines the best set of parameters

as β_0 , β_1 , β_2 and β_3 in the model $Y_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$ or the alternative $G_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$ by minimizing the residual error (the sum of squares of the deviations of the estimated Y_i or G_i, given by the regression model, from their observed values in the table). A model is generally a good representation of the existing relationship if it is significant at or above the 95% level of confidence. In other words, we can say with 95% confidence or above that at least one of the coefficients of the regression model is not zero. If the model is significant at a lower level of confidence, it does not provide a good fit for the envisaged relationship and should not be used. The level of confidence is part of the Excel output tables below.

Finally, the significance of each individual coefficient in the regression model was tested. In other words, with what level of confidence would we say that coefficient β_i is not zero? If the confidence level is at least 95%, we would generally admit that the coefficient is significant. If a coefficient is not significant, we may drop it in order to develop a better model. Generally, a model is of good fit if each of its coefficients is significant and the model itself is significant. Conventionally, the significance threshold is crossed at 95% for both tests. In the Excel output below, the level of confidence of the significance of each coefficient is given by $(1-P_i)$, where P_i is the probability that the coefficient is insignificant.

Below we reproduce the correlation and regression test for data in table N1 above for the model: $Y_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$

CORRELATIONS 2003 – 2012

VARIABLE	*Yi*	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.839	1.000			
ρi	0.301	0.621	1.000		
gi	0.050	0.068	-0.123	1.000	
θi	0.009	-0.303	-0.537	-0.357	1.000

The table shows weak if positive correlations between the p/e ratio, Y_i , and the growth in stock prices ρ_i (0.301), the growth in earnings g_i (0.05), and the average annual riskless rate θ_i (0.009), for the NSE for the period 2003 – 2012. It also shows a strong positive correlation between the growth in the p/e ration, G_i, and the growth in stock prices, ρ_i (0.621), and a weak positive correlation between growth in p/e and growth in earnings (0.068). Similarly, the correlation between the growth in p/e and the average annual riskless rate θ_i is weak and negative (-0.303). As expected, the p/e and its growth rate in any one year are strongly correlated.

A necessary question is, are these correlations reflected over the short term as well? A ten year period may provide time enough for non-systemic turbulences in the stock markets to smoothen out, allowing for clearer relationships that might otherwise be blurred over shorter periods of time. We test for correlations over the two, 5-year periods covering 2003-2012 below:

CORRELATIONS 2003-2007

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.911	1.000			
ρi	0.306	0.528	1.000		
gi	-0.006	-0.055	-0.469	1.000	
θi	0.268	-0.087	-0.448	-0.314	1.000

The table above shows that the relationships between the p/e ratio and growth in stock prices was more or less the same over 2003-2007 as it was over 2003-2012.

CORRELATIONS 2008-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.416	1.000			
ρi	0.337	0.843	1.000		
gi	0.652	0.157	0.498	1.000	
θi	-0.781	-0.468	-0.467	-0.439	1.000

The 2008-2012 period however presents an interesting picture. While the relationship between the p/e ratio and growth in stock prices remains similar to that over the 10 year period (i.e. moderate), it is stronger between the p/e ratio and growth in earnings (+0.652 as opposed to 0.05 over the 10 years) and between the p/e ratio and the average annual riskless rate (-0.781 as opposed to 0.009 over the 10 years), where in the latter the direction of the relationship is now strong and negative. The correlations are also stronger over 2008-2012 for the growth in p/e and the other variables than is the case over the 10 year period.

How about the test for regression? We reproduce this below. The results show that the model tested $Y_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$ is not significant (confidence level is only 0.267 or 26.7%) for the 10 year data. Indeed, looking at the P-values for the intercept β_0 (0.886), β_1 (0.573), β_2 (0.298) and β_3 (0.469) it is obvious that these coefficients are not significant since the confidence levels (i.e. 1 – P-value) are only 11.4% (β_0), 42.7% (β_1), 70.2% (β_2), and 53.1% (β_3).

REGRESSION SUMMARY OUTPUT FOR NSE FOR YEARS 2003 - 2012

Regression Statistics	
Multiple R	0.425
R Square	0.180
Adj. R Square	-0.230
Standard Error	12.588
Observations	10.000

$$Y_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$$

ANOVA					*Significance*	*Confidence*
	df	*SS*	*MS*	*F*	*F*	*level*
Regression	3	209.159	69.720	0.440	0.733	0.267
Residual	6	950.783	158.464			
Total	9	1159.943				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	-2.623	17.524	-0.150	0.886	-45.502	40.257
ρi	10.816	9.502	1.138	0.298	-12.435	34.068
gi	4.639	7.780	0.596	0.573	-14.398	23.676
θi	153.521	198.468	0.774	0.469	-332.113	639.155

Progressively eliminating the most insignificant coefficients (in this case β_0, β_1, and β_3) yields and improved model, i.e. $Y_i = \beta_2 \rho_i + \varepsilon_i$ which is tested below:

BEST Y_i REGRESSION SUMMARY OUTPUT FOR NSE YEARS 2003-2012

Regression Statistics	
Multiple R	0.496
R Square	0.246
Adj. R Square	0.135
Standard Error	15.077
Observations	10.000

$$Y_i = \beta_2 \rho_i + \varepsilon_i$$

ANOVA					*Significance*	*Confidence*
	df	*SS*	*MS*	*F*	*F*	*level*
Regression	1	666.965	666.965	2.934	0.125	0.875
Residual	9	2045.743	227.305			
Total	10	2712.708				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	13.682	7.987	1.713	0.121	-4.387	31.750

The results show that the regression model is not significant at the 95% confidence level, since it has only 87.5% confidence. Similarly, the best coefficient, β_2 for the term $\beta_2\rho_i$ is also not significant at the 95% level as it has only an 87.9% confidence.

The results of the correlation and regression tests above show only a weak to moderate relationship between the p/e ratio and growth in stock prices, growth in earnings, and the average annual riskless rate. The relationship is indeed only marginally significant between the p/e ratio and the growth in stock prices.

What about the model $G_i = \beta_0 + \beta_1 g_i + \beta_2\rho_i + \beta_3\theta_i + \varepsilon_i$? The correlations above show a moderate (0.621 over 2003-2012) to strong (0.843 over 2008-2012) relationship between the growth in p/e and the growth in earnings. Would this model be a better fit for the data presented? We test the regression model below. The model tested is $G_i = \beta_0+\beta_1 g_i+\beta_2\rho_i+\beta_3\theta_i+\varepsilon_i$ over the period 2003-2012. The confidence level for the model is 68.5%, and it is therefore not significant at the 95% confidence level. Similarly, none of the regression coefficients is significant at the 95% level (from the results of 1 – P-values above). The most promising is β_2 for the term $\beta_2\rho_i$ with a confidence level of (1-0.113) or 88.7%.

REGRESSION SUMMARY OUTPUT FOR NSE FOR YEARS 2003 - 2012

Regression Statistics	
Multiple R	0.651
R Square	0.423
Adj. R Square	0.135
Standard Error	0.945
Observations	10

$G_i = \beta_0+\beta_1 g_i+\beta_2\rho_i+\beta_3\theta_i+\varepsilon_i$

ANOVA					*Significance*	*Confidence*
	df	*SS*	*MS*	*F*	*F*	*level*
Regression	3	3.934	1.311	1.468	0.315	0.685
Residual	6	5.360	0.893			
Total	9	9.293				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	-0.452	1.316	-0.344	0.743	-3.672	2.767
ρ_i	1.322	0.713	1.853	0.113	-0.424	3.068
g_i	0.360	0.584	0.616	0.560	-1.069	1.789
θ_i	6.172	14.901	0.414	0.693	-30.290	42.633

If we eliminate each insignificant coefficient and regress until the last, we obtain an increasingly better estimate for the term G_i . The best estimate for this model eventually becomes a single coefficient output $G_i = \beta_2 \rho_i + \varepsilon_i$ with the regression test below:

BEST G_i REGRESSION SUMMARY OUTPUT FOR NSE FOR YEARS 2003-2012

Regression Statistics	
Multiple R	0.686
R Square	0.471
Adj. R Square	0.360
Standard Error	0.811
Observations	10.000

$G_i = \beta_2 \rho_i + \varepsilon_i$

ANOVA					*Significance*	*Confidence*
	df	*SS*	*MS*	*F*	*F*	*level*
Regression	1	5.278	5.278	8.018	0.022	0.978
Residual	9	5.925	0.658			
Total	10	11.203				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	1.217	0.430	2.832	0.020	0.245	2.189

The model tested is $G_i = \beta_2 \rho_i + \varepsilon_i$ over the period 2003 – 2012. From the test results, it is evident that both the model and the single coefficient are significant at levels above the 95% confidence level. The model has a significance level of 97.8% while the lone coefficient has a significance level of 98%. Thus, both the correlation as well as the regression test results provide evidence that there was a strong and positive relationship between the growth in p/e ratio and the growth in earnings at the NSE over the ten year period 2003 – 2012.

How about regression test results for the two 5-year periods, i.e. 2003 – 2007 and 2008 – 2012? Below we tabulate the 'best estimate' regression models for each of the two periods. Notice the interesting results. The best fit for the period 2003 – 2007 remains $G_i = \beta_2 \rho_i + \varepsilon_i$ with confidence levels of 87.1% and 89.4% respectively for the model and the single coefficient. For the 2008 – 2012 period, this surprisingly changes to $Y_i = \beta_3 \theta_i + \varepsilon_i$ with confidence levels of 97% and 98.3% for the model and the single coefficient respectively. The next closest model for 2008 – 2012 still remains $G_i = \beta_2 \rho_i + \varepsilon_i$ with confidence levels of the model and coefficient at 93.4% and 95.3% respectively. The relevant table for 2003 – 2007 is Table N2 below and is a subset of Table N1.

TABLE N2 - ALL NSE SUMMARY DATA : 2003 - 2007 FOR ALL LISTED COMPANIES

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	12.74	1.57	1.46	(0.56)	0.04
2004	11.88	1.11	0.39	1.81	0.03
2005	41.51	2.65	0.48	0.40	0.08
2006	6.81	(0.23)	0.49	0.40	0.07
2007	(3.64)	(0.50)	(0.32)	0.32	0.07

The 'best fit' regression model for the data above is $G_i = \beta_2 \rho_i + \varepsilon_i$ with a confidence level of 87.1% and is reproduced in the table below:

BEST REGRESSION SUMMARY OUTPUT FOR NSE FOR YEARS 2003-2007

$G_i = \beta_2 \rho_i + \varepsilon_i$

Regression Statistics	
Multiple R	0.721
R Square	0.519
Adj. R Square	0.269
Standard Error	1.151
Observations	5.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	5.726	5.726	4.325	0.129	0.871
Residual	4	5.296	1.324			
Total	5	11.022				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	1.416	0.681	2.080	0.106	-0.474	3.306

It is evident that the 'best fit' for the period 2003 – 2007 is not significant at the 95% level for both the model and the regression coefficient. Nevertheless, the fact that the model and the coefficient have 87.1% and 89.4% confidence levels confirm the positive correlation of 0.528 between the p/e ratio and the growth in earnings for this period for the NSE. The data for years 2008 – 2012 is in Table N3 below and is a subset of Table N1. The 'best fit' for the period 2008 – 2012 is $Y_i = \beta_3 \theta_i + \varepsilon_i$ which has a significance level of 97%. The coefficient is significant at 98.3%.

TABLE N3 - ALL NSE SUMMARY DATA : 2008 - 2012 FOR ALL LISTED COMPANIES

(WEIGHTED ANNUAL AVERAGES OF PER SHARE DATA, EARNINGS AND T-BILL RATES)

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2008	12.86	(0.19)	(0.19)	0.67	0.08
2009	11.86	0.04	(0.23)	(0.15)	0.07
2010	12.59	0.23	0.70	0.57	0.04
2011	9.08	(0.30)	(0.35)	0.01	0.09
2012	8.92	(0.01)	0.07	0.05	0.13

BEST REGRESSION SUMMARY OUTPUT FOR NSE FOR YEARS 2008-2012

$$Y_i = \beta_3 \theta_i + \varepsilon_i$$

Regression Statistics	
Multiple R	0.890
R Square	0.793
Adj. R Square	0.543
Standard Error	5.695
Observations	5.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	496.844	496.844	15.321	0.030	0.970
Residual	4	129.716	32.429			
Total	5	626.560				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
θi	114.496	29.251	3.914	0.017	33.281	195.711

Table S in the Appendix lists the companies included in the sectors of the NSE. Reproduced in the Appendix also are tables S1 – S10 (for sectors 1 to 10) containing weighted averages of per share data, earnings and 91-Day T-Bill rates for each of the ten sectors of the NSE. This data was useful in examining whether relationships

determined from Table N1 (i.e. the entire NSE market) also held at the sector level, and whether or not at this level they were more, or less pronounced. Together with these tables, which contain the data for the dependent variable (Y_i or G_i) and each of the independent variables (ρ_i, g_i and θ_i) for each of the segments of the NSE, we reproduce the correlation tables and the 'best fit' regression models for each segment of the market for the entire 10 year period. These models reflect the most realistic effects of the growth of stock prices and company earnings on the p/e ratio of companies listed at the NSE.

The relationships identified by the various correlation and regression analyses for the 10 sectors of the NSE over the 10 year period, and presented in the Appendix, are summarized below. The p/e ratio and growth in the p/e ratio had moderate to strong correlation with both growth in stock prices and growth in earnings in the Commercial and Investment segments. The p/e ratio and growth in the p/e ratio had moderate to strong correlation with growth in stock prices in the Agricultural and Construction segments. Also, the p/e ratio and growth in the p/e ratio had moderate to strong correlation with growth in earnings in the Automobile and Manufacturing segments. The p/e ratio had a strong correlation with growth in earnings within the Telecommunications segment, while the growth in the p/e ratio had moderate to strong correlation with growth in stock prices in the Energy, Insurance and Telecoms segments.

Except for the p/e ratio, the average annual riskless rate was negatively correlated with growth in the p/e ratio, growth in stock prices and growth in earnings across all segments. The negative correlation with growth in prices was particularly strong in the Manufacturing and Telecoms sectors. However, the riskless rate showed a

moderate to strong correlation with the p/e ratio only within the Energy segment. An interesting result was the negative correlation between the p/e ratio and growth in earnings within the Investment segment. Tables describing these correlation and the 'best fit' regression models are reproduced in the Appendix.

4.3 Summary and Interpretation of the Findings

The results of the study found that the p/e ratio had a moderate correlation (+0.301) with the growth of stock prices over the 10 year period. That was also the case (+0.306) when the period of study was reduced to the 2 five year periods of 2003-2007 and 2008-2012. The weak but positive association is consistent with findings by Beaver and Morse (1978) and Penman (1996). Overall, there was a positive correlation between the growth in stock price and the p/e. However, both the average riskless rate and growth in earnings had an insignificant influence on the p/e ratio for the 10 year period. That conclusion would not hold if we had confined the study to the last 5 years of the study period. This is because there was a moderate to strong positive relationship (+0.652) between the growth of earnings and the p/e ratio for the period 2008 – 2012, and a strong negative relationship (-0.781) between the riskless rate and the p/e ratio over this 5 year period.

The general positive relationship between the p/e and growth in stock prices, even though only moderate, seem to point to the NSE as a net growth versus value exchange. In other words the per shilling concentration of growth stocks may outweigh that of value stocks over the 10 year period. This may explain why the association of the p/e ratio with the growth of stock prices was particularly strong (+0.763) for the Construction and Allied segment of the NSE. Other sectors that

reflected this trend, albeit at a moderate level (+0.408 to +0.475), were Agricultural, Commercial and Investment segments. The p/e ratio also had a moderate to strong positive association (+0.455) with growth of earnings in these sectors, except for the Investment segment, where the association was negative (-0.443). The positive association of the p/e ratio and growth in earnings was strong for the Telecommunications segment (+0.769).

Not surprisingly, the growth in the p/e ratio had a moderate to strong positive association (+0.621) with the growth in stock prices over the 10 year period. This association was particularly strong (+0.843) over the 2008 – 2012 period. This market behaviour was replicated across sectors of the NSE: except for the Automobile and Manufacturing sectors, all other segments of the NSE had a moderate to strong association (+0.402 to +0.843) between the growth in the p/e ratio and growth in stock prices, confirming the theoretical predictions by Gordon (1962) and Fairfield (1994) and Zarowin (1990). The 'best fit' estimator for the market for growth of p/e ratio was $G_i = \beta_2 \rho_i + \varepsilon_i = 1.217\ \rho_i$ with a 98% confidence level for 10 years. However, the growth in p/e ratio had only moderate association with the growth in earnings for segments of the NSE such Automobile, Manufacturing and Commercial sectors, and that association was generally insignificant over the 10 year period.

Another group of important relationships was that between the independent variables themselves. The study found generally moderate relationships between the growth in stock prices, the growth in earnings and the weighted average annual riskless rate. Whereas the 10 year, overall market relationship between the growth in stock prices and the growth in earnings was insignificant, that relationship was moderate and negative (-0.469) for the period 2003 – 2007 and reversed to moderate and positive

(+0.498) over 2008 – 2012. The most consistent relationship was a moderate to strong negative association (-0.255 to -0.711) between the growth in stock prices and the riskless rate. This may point to the reality that the NSE and government securities are as much alternative investment sectors as they are complimentary. Higher rates in government securities draw investments funds away from stocks, and vice-versa.

An intriguing relationship was a moderate but consistently negative relationship (-0.055 to -0.647) between the riskless rate and the growth in earnings. This may be due to the fact that the riskless rate, being a benchmark rate for lending institutions like banks and finance companies, affects the borrowing rate for NSE companies and therefore affects their costs of borrowing. Higher borrowing costs would mean lower growth in earnings, since it may mean less borrowing and declining investment in earning assets.

Overall, the general models for estimating the p/e ratio $Y_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$ and the growth in p/e ratio $G_i = \beta_0 + \beta_1 g_i + \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$ were not good estimators at the 95% confidence level. The best for the p/e ratio was not significant even at 30% confidence level. The closest fit for the period was $Y_i = 13.682 \rho_i$ with a confidence level of 87%, which was not significant, while for the growth in p/e ratio the best was $G_i = 1.217 \rho_i$ with a confidence level of 98%. This was the only valid estimator. The results show that whereas all three variables may influence the p/e ratio, the greatest influence for the 10 years was between the growth in p/e and growth in stock prices.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The objective of this study was to examine the effect of the growth of stock prices and the growth of earnings on the p/e ratio of companies listed at the NSE over the 10 year period 2003 – 2012. Since the riskless rate has an important influence on the prevailing market interest rates and on the cost of funds for these companies, we sought to capture also the influence that the 91-day T-Bill rate would have on the p/e ratio of these companies. Research around the world, especially in the developed stock exchanges, had shown varying degrees of relationships between the p/e ratio and the growth in stock prices, growth in earnings and prevailing interest rates. Our interest was to determine the nature of similar relationships at the NSE.

The study found only a weak to moderate relationship between the p/e ratio and the growth of stock prices, and a weak relationship between the p/e ratio and the growth of earnings. These relationships are stronger over shorter and more recent sample periods than over longer and older periods. Such findings are consistent with those from similar empirical studies by Beaver and Morse (1978), Penman (1996), Campbell and Shiller (1998) and Vorek (2009). The strong negative association between the p/e ratio and the riskless rate over the period 2008 – 2012 also echo results from studies by Chowdhry and Titman (2001) and theoretical predictions by Gordon (1962) and Fairfield (1994).

The study found that there was a strong positive association between the growth in the p/e ratio and the growth in stock prices, both at the market (NSE) and portfolio (NSE

segment) levels. This association was stronger for the 2008 – 2012 period than for the 2003 – 2007 period and the overall 10 year period, implying that, like the case for the p/e ratio, more recent sample periods may produce significantly pronounced relationships than older sample periods. The growth in p/e ratio had only a marginal if positive association with growth in earnings, and a moderate, negative association with the riskless rate.

Finally, the study found a moderate to strong relationship between the riskless rate and growth in stock prices of firms listed at the NSE, confirming expected shifts in invested funds between the NSE and government securities based on expected returns and risk. The riskless rate also had a moderate negative relationship with the growth in earnings of firms listed at the NSE. This suggests that the level of the riskless rate affects the cost of borrowing funds by companies listed at the NSE and the rate of investment of such funds, with a lower or higher riskless rate leading to a higher or lower rate of investment and of the growth in earnings.

5.2 Conclusion

There is only a moderate if positive relationship between the p/e ratio and growth in stock prices for the NSE. This association is stronger for certain sectors, like agricultural, commerce, construction and investment segments than for the NSE as a whole. Such sectors hold promise of good growth opportunities over the long term, and the market may be pricing future earnings from these sectors at a premium above the rest.

Similarly, the association between the p/e ratio and growth in earnings is positive but weak for the NSE but more pronounced for certain sectors like automobile, commerce, manufacturing and telecommunications segments. From the discounted

cash flow model for equity valuation, assuming constant dividend growth, a positive correlation should be observed between the p/e ratio and growth in earnings and stock prices, holding risk constant. It maybe that segments of the NSE are more efficient at pricing earnings than the market as a whole.

Also, if we consider the market price of the stock as the discounted expected earnings per share plus the net present value of future growth opportunities for the firm, then the stock of the firm with higher growth opportunities should sell higher than the stock of the firm without. The p/e ratio would therefore be positively related to growth in stock prices and earnings and negatively related to the firm's discount rate and the risk of the stock. Such relationships seem to hold, even if only moderately, at the sector level, but not in the overall NSE market. This leads to a similar conclusion as above that the segments of the NSE or individual portfolios, may be better at pricing earnings growth than the NSE itself.

There exists a pronounced association between the growth in p/e ratio and the growth in stock prices. This is evident at both the sector and market levels. This is also stronger for current periods than older periods, and for sectors than for the entire NSE. It maybe that the NSE is slowly coming of age, and that the exchange maybe developing into an efficient market in the weak form as it continues to liberalize. This may explain why later periods produce stronger expected theoretical relationships than older periods.

5.3 Policy Recommendations

Efficient markets set prices to reflect available information. In its weakest form, market efficiency allows prices of financial assets to incorporate information already available to the investing public. It may not be possible to create perfect markets, but

we can help markets set prices responsibly. The basis of responsible demand and supply of financial assets should be an informed investing public having instant access to accurate, relevant investment or market information. The overriding objective should be to move the NSE toward a strongly efficient, 24-hour exchange.

The NSE, working with the CMA and relevant private and public institutions, can make it easy for investors to quickly and freely access financial data on listed companies. Such data should include comprehensive financial statements prepared on a consistent basis and complying with the requirements of the IFRS. This data should be available for each company freely on the NSE website for all the years the company has listed at the NSE. It should not cost a penny.

Hosting on the NSE website comparable, IFRS – compliant financial statements for each listed firm for all the trading years is not enough. It would be helpful if the same website also hosted tools for analysing that data – software investors can use to interrogate the financial statements and obtain key performance statistics and allow for projections into the future. Such software should have a simple enough interface to allow for barely literate investors to query key statistics and obtain them. Nor should the website contain only financial information: information on composition of the board of the company, its senior management and persons heading key functions of the company should be available, including past employers and positions held there. There should also be a portal for new announcements about the company.

The current reform streak at the NSE is a good one could incorporate these changes, and more. The NSE should create a wiz platform that allows the public to trade directly with itself, online, and not through the stock broker. Brokers drive up transaction costs, slow down deals and create artificial supply / demand situations for

financial assets. Indeed, they are part of market inefficiency. Online trading would allow investors to quickly close deals, minimize transaction times, drive down transaction costs, and to monitor emerging opportunities for supply and demand. It would also in effect create a 24 – hour securities exchange. The overriding objective here is to move the exchange toward a 24/7 efficient market.

The NSE should bench mark its operations, including its operating and trading rules, to developed stock exchanges like the New York Stock Exchange, the London FTSE, and the Tokyo Stock Exchange. Benchmarking should not and cannot mean simply following in their footsteps. It should aim at learning from them to create something better: a more efficient, more reliable exchange. In this sense, they become a basic, minimum standard: but we need to go further. We need to look deeply inward too.

We must develop an exchange that recognizes and responds effectively to local challenges and opportunities. More than 50% of NSE's current and potential investors are not financially literate. A good portion of that may not even be literate at all. Rural folk, including farmers and traders, may have funds to invest at the NSE but find market participation improbable. This rural investor may want to buy shares in the morning, pay by Mpesa, sell in the afternoon and have money in the Mpesa account by evening, ready for the local *soko*.

And then there is the opportunity afforded by mobile money in making easy, quick settlements. Today, the bank a/c sits snugly in a nondescript mobile phone, all across Kenya: at the workplace, at the farm, in the matatu, at home. It allows for instant, efficient digital money transfers. The NSE can tap into that opportunity and make a lot of money in doing so. Kenya is arguably the world's foster child in mobile money. The runaway success of MPESA and other mobile money services is testimony to our

creativity as a country and our willingness to take risks. We can do the same with the NSE, and make it strongly efficient.

5.4 Limitations of the Study

The study encountered various challenges. While the data required was readily available in the NSE Handbook for the particular periods researched, it was not available for certain companies for some years, mainly because these companies had not been listed by then. This was the case for the various sectors like the banking, insurance, investment and energy segments. This limitation meant that year to year data was compared for an NSE market that kept changing in numbers of listed companies, ranging from 43 in 2003 to 61 in 2012. Needless to say, relationships form better within bigger populations than smaller ones. Also, data on non – identical populations were compared across years, reducing its efficacy in research.

Data available in the NSE Handbooks was largely accurate. The study carried out basic validity tests to confirm per share data. However, in certain cases, especially for year 2012, a significant portion of the population published their financial statements using IFRS – compliant formats. Others stuck to traditional formats, resulting in different formats of presenting income and per share data. IFRS – compliant formats require a two – stage income presentation: the Income Statement and the Statement of Comprehensive Income. The traditional method is the basic Profit & Loss A/c. Also, IFRS require presentation of per share data using basic and diluted earnings per share. Traditional methods simply present earnings per share, without separating basic from diluted. The effect of these differences in presentation was insignificant however,

since companies generally did not have ‘other comprehensive income’ to report and basic and diluted earnings per share were the same amount.

5.5 Suggestions for Further Research

Similar research should be conducted using more refined data than used in this study. For example, per share data should be based on average number of shares outstanding for the year rather than the number of shares outstanding at the end of the year.

Market price per share should similarly be a weighted average stock price for the year, rather than the closing stock price, which may not reflect the share’s performance for the entire year or relate realistically to the company’s overall performance for that year.

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APPENDIX

TABLE S: SEGMENTS OF THE NAIROBI SECURITIES EXCHANGE

SEGMENT	COMPANIES IN EACH SEGMENT
AGRICULTURAL	Eaagads Ltd, Kakuzi Ltd, Kapchorua Tea Company Ltd, Limuru Tea company Ltd, Rea Vipingo Plantations Ltd, Sasini Tea and Coffee Ltd, Williamson Tea Kenya Ltd
AUTOMOBILE & ACCESSORIES	Car and General (Kenya) Ltd, CMC Holdings Ltd, Marshalls (EA) Ltd, Sameer Africa Ltd
BANKING	Barclays Bank of Kenya Ltd, CFC Stanbic Bank Ltd, Diamond Trust Bank Kenya Ltd, Equity Bank Ltd, Housing Finance Company of Kenya Ltd, I&M Bank Ltd, Kenya Commercial Bank Ltd, National Bank of Kenya Ltd, NIC Bank Ltd, Standard Chartered Bank Ltd, Co-operative Bank of Kenya Ltd
COMMERCIAL	Express Kenya Ltd, Kenya Airways Ltd, Nation Media Group Ltd, Scangroup Ltd, Standard Group Ltd, TPS (EA) Ltd, Uchumi Supermarket Ltd
CONSTRUCTION & ALLIED	Athi River Mining Ltd, Bamburi Cement Company Ltd, Crown-Berger Kenya Ltd, East African Cables Ltd, East African Portland Cement Company Ltd
ENERGY & PETROLEUM	Kenya Electricity Generating Company (KenGen) Ltd, Kenya Oil Company Ltd, Kenya Power Ltd, Total Kenya Ltd
INSURANCE	Jubilee Holdings Ltd, Kenya Reinsurance Corporation Ltd, Pan Africa Insurance Company Ltd
INVESTMENT	Centum Investment Company Ltd (ICDCI), Olympia Capital Holdings Ltd
MANUFACTURING & ALLIED	BOC Kenya Ltd, British American Tobacco Kenya Ltd, Carbacid Investments Ltd, East African Breweries Ltd, Eveready East Africa Ltd, Mumias Sugar Company Ltd, Unga Group Ltd
TELECOMMUNICATION & TECHNOLOGY	Access Kenya Group Ltd, Safaricom Ltd

TABLE S1 - NSE SUMMARY DATA : 2003 - 2012 AGRICULTURAL SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	34.62	6.31	0.54	(2.91)	0.04
2004	(1.08)	(0.05)	0.67	21.41	0.03
2005	3.63	(0.85)	0.72	(0.37)	0.08
2006	7.13	1.19	0.30	0.71	0.07
2007	(328.49)	(6.92)	(0.34)	0.37	0.07
2008	(3.42)	0.57	(0.45)	14.92	0.08
2009	3.12	0.24	(0.20)	0.33	0.07
2010	5.99	0.73	1.15	0.68	0.04
2011	4.84	0.41	(0.09)	0.83	0.09
2012	(11.56)	(2.62)	(0.05)	(0.87)	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.796	1.000			
ρi	0.408	0.402	1.000		
gi	0.096	-0.024	-0.035	1.000	
θi	-0.064	-0.419	-0.574	-0.327	1.000

BEST REGRESSION SUMMARY OUTPUT FOR AGRICULTURAL SEGMENT 2003-2012

Regression Statistics	
Multiple R	0.354
R Square	0.125
Adj. R Square	0.014
Standard Error	3.083
Observations	10.000

$$G_i = \beta_2 \rho_i + \varepsilon_i$$

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	12.243	12.243	1.288	0.289	0.711
Residual	9	85.549	9.505			
Total	10	97.792				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	2.007	1.768	1.135	0.286	-1.993	6.007

TABLE S2 - NSE SUMMARY DATA : 2003 - 2012 AUTOMOBILES & ACCESSORIES SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	19.76	0.97	0.86	0.21	0.04
2004	12.04	(0.26)	0.04	0.62	0.03
2005	23.69	0.90	0.58	0.14	0.08
2006	(229.42)	(8.49)	0.34	(0.83)	0.07
2007	17.53	0.33	(0.68)	2.46	0.07
2008	11.27	(0.22)	(0.02)	0.33	0.08
2009	9.81	(0.14)	(0.35)	(0.25)	0.07
2010	23.77	1.48	0.36	(0.38)	0.04
2011	(21.07)	(2.17)	(0.20)	(0.68)	0.09
2012	46.65	1.61	(0.02)	1.33	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.982	1.000			
ρi	-0.131	-0.019	1.000		
gi	0.483	0.481	-0.463	1.000	
θi	0.045	-0.004	-0.317	0.197	1.000

BEST REGRESSION SUMMARY FOR AUTOMOBILE & ACCESSORIES SEGMENT 2003-2012

$$Y_i = \beta_1 g_i + \varepsilon_i$$

Regression Statistics	
Multiple R	0.424
R Square	0.180
Adj. R Square	0.069
Standard Error	72.356
Observations	10.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	10326.880	10326.880	1.972	0.198	0.802
Residual	9	47119.022	5235.447			
Total	10	57445.902				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
gi	32.569	23.190	1.404	0.194	-19.890	85.027

TABLE S3 - NSE SUMMARY DATA : 2003 - 2012 BANKING SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	15.63	3.42	2.02	0.38	0.04
2004	14.50	0.02	0.05	0.15	0.03
2005	68.49	5.04	0.34	0.16	0.08
2006	22.69	(0.23)	0.08	0.34	0.07
2007	21.69	0.03	(0.38)	0.33	0.07
2008	13.53	(0.38)	(0.22)	0.36	0.08
2009	14.08	(0.09)	(0.38)	0.13	0.07
2010	11.97	0.06	0.66	1.08	0.04
2011	6.93	(0.31)	(0.48)	0.17	0.09
2012	6.68	0.15	0.29	0.25	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.782	1.000			
ρi	0.071	0.597	1.000		
gi	-0.207	-0.137	0.347	1.000	
θi	-0.010	-0.114	-0.380	-0.359	1.000

BEST REGRESSION SUMMARY OUTPUT FOR BANKING SEGMENT 2003-2012

$$G_i = \beta_2 \rho_i + \varepsilon_i$$

Regression Statistics	
Multiple R	0.635
R Square	0.404
Adj. R Square	0.293
Standard Error	1.575
Observations	10.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	15.112	15.112	6.095	0.039	0.961
Residual	9	22.315	2.479			
Total	10	37.427				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	1.690	0.684	2.469	0.036	0.141	3.238

TABLE S4 - NSE SUMMARY DATA : 2003 - 2012 COMMERCIAL SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	3.50	0.35	0.28	(0.73)	0.04
2004	10.74	4.09	0.51	2.16	0.03
2005	38.40	2.09	1.10	1.25	0.08
2006	15.25	1.04	2.33	2.21	0.07
2007	13.83	(0.08)	(0.06)	0.10	0.07
2008	10.99	(0.26)	(0.32)	(0.05)	0.08
2009	6.72	(0.50)	(0.35)	(0.76)	0.07
2010	14.13	2.63	1.11	0.80	0.04
2011	9.42	(0.02)	(0.33)	0.02	0.09
2012	12.80	0.72	0.05	(0.12)	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.345	1.000			
ρi	0.439	0.501	1.000		
gi	0.455	0.759	0.771	1.000	
θi	0.199	-0.493	-0.257	-0.295	1.000

BEST REGRESSION SUMMARY OUTPUT FOR COMMERCIAL SEGMENT 2003-2012

$$G_i = \beta_i g_i + \varepsilon_i$$

Regression Statistics	
Multiple R	0.807
R Square	0.652
Adj. R Square	0.541
Standard Error	1.078
Observations	10.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	19.593	19.593	16.847	0.003	0.997
Residual	9	10.467	1.163			
Total	10	30.060				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
gi	1.233	0.300	4.105	0.003	0.553	1.912

TABLE S5 - NSE SUMMARY DATA : 2003 - 2012 CONSTRUCTION & ALLIED SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	91 - DAY T-BILL RATE θ_i	GROWTH IN EARNINGS g_i
2003	34.00	2.05	2.30	0.04	0.25
2004	12.62	(0.70)	(0.11)	0.03	0.49
2005	21.02	0.54	0.78	0.08	0.78
2006	30.36	0.73	0.26	0.07	0.22
2007	18.77	(0.38)	(0.07)	0.07	0.52
2008	15.56	(0.16)	(0.22)	0.08	(0.05)
2009	10.16	(0.31)	(0.07)	0.07	0.76
2010	9.22	(0.92)	0.21	0.04	(0.26)
2011	9.14	(0.23)	(0.31)	0.09	0.60
2012	13.99	0.38	(0.11)	0.13	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*ϑi*	*gi*
Yi	1				
Gi	0.868	1.000			
ρi	0.763	0.833	1.000		
θi	-0.181	0.071	-0.383	1.000	
gi	-0.029	0.049	-0.026	0.086	1.000

BEST REGRESSION SUMMARY OUTPUT FOR CONSTRUCTION SEGMENT 2003-2012

$$G_i = \beta_2 \rho_i + \beta_3 \theta_i + \varepsilon_i$$

Regression Statistics	
Multiple R	0.934
R Square	0.872
Adj. R Square	0.835
Standard Error	0.351
Observations	10.000

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	2	5.863	2.932	23.767	0.001	0.999
Residual	7	0.863	0.123			
Total	9	6.727				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	-1.148	0.343	-3.350	0.012	-1.959	-0.338
ρi	1.116	0.162	6.874	0.000	0.732	1.500
θi	13.589	4.361	3.116	0.017	3.278	23.900

TABLE S6 - NSE SUMMARY DATA : 2003 - 2012 ENERGY & PETROLEUM SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	91 - DAY T-BILL RATE θ_i	GROWTH IN EARNINGS g_i
2003	8.31	(0.12)	1.42	0.04	0.09
2004	19.06	4.96	0.84	0.03	0.54
2005	12.05	(0.02)	0.21	0.08	0.39
2006	11.44	(0.03)	(0.01)	0.07	0.00
2007	21.85	0.03	(0.29)	0.07	(0.31)
2008	9.02	(0.56)	(0.07)	0.08	1.27
2009	14.22	0.59	(0.37)	0.07	(0.54)
2010	9.63	(0.03)	(0.20)	0.04	0.55
2011	5.69	(0.56)	(0.38)	0.09	0.05
2012	1.37	(0.62)	(0.39)	0.13	(0.63)

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*ϑi*	*gi*
Yi	1				
Gi	0.574	1.000			
ρi	0.147	0.444	1.000		
θi	-0.566	-0.573	-0.633	1.000	
gi	0.051	0.170	0.281	-0.407	1.000

BEST REGRESSION SUMMARY OUTPUT FOR ENERGY SEGMENT 2003-2012

Regression Statistics	
Multiple R	0.735
R Square	0.541
Adj. R Square	0.430
Standard Error	9.024
Observations	10.000

$$Y_i = \beta_3 \theta_i + \varepsilon_i$$

ANOVA					*Significance*	*Confidence*
	df	*SS*	*MS*	*F*	*F*	*level*
Regression	1	863.475	863.475	10.603	0.012	0.988
Residual	9	732.922	81.436			
Total	10	1596.397				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
θi	123.514	37.931	3.256	0.010	37.707	209.321

TABLE S7 - NSE SUMMARY DATA : 2003 - 2012 INSURANCE SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	91 - DAY T-BILL RATE θ_i	GROWTH IN EARNINGS g_i
2003	(23.87)	(0.07)	2.30	0.04	(0.16)
2004	9.38	0.65	0.01	0.03	2.99
2005	8.56	(0.11)	0.70	0.08	0.92
2006	35.53	3.08	1.97	0.07	(0.26)
2007	19.25	(0.40)	(0.12)	0.07	0.67
2008	11.45	(0.39)	(0.18)	0.08	0.36
2009	11.12	(0.08)	(0.13)	0.07	0.03
2010	8.82	(0.20)	0.08	0.04	0.80
2011	4.56	(0.47)	(0.24)	0.09	0.50
2012	4.42	1.43	0.16	0.13	1.70

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*ϑi*	*gi*
Yi	1.000				
Gi	0.504	1.000			
ρi	-0.203	0.504	1.000		
θi	0.165	0.182	-0.255	1.000	
gi	-0.021	0.008	-0.440	-0.055	1.000

BEST REGRESSION SUMMARY OUTPUT FOR INSURANCE SEGMENT2003-2012

Regression Statistics	
Multiple R	0.567
R Square	0.321
Adj. R Square	0.210
Standard Error	0.973
Observations	10.000

$$G_i = \beta_2 \rho_i + \varepsilon_i$$

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	4.032	4.032	4.260	0.073	0.927
Residual	9	8.519	0.947			
Total	10	12.550				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	0.641	0.311	2.064	0.069	-0.062	1.343

TABLE S8 - NSE SUMMARY DATA : 2003 - 2012 INVESTMENT SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	18.79	0.90	2.47	0.83	0.04
2004	6.92	(0.63)	(0.09)	1.48	0.03
2005	13.98	1.02	0.01	(0.50)	0.08
2006	20.95	0.50	0.94	0.29	0.07
2008	15.83	0.20	(0.07)	(0.22)	0.08
2009	17.11	0.09	(0.57)	(0.56)	0.07
2010	9.80	(0.08)	0.48	2.26	0.04
2011	10.19	(0.22)	0.24	0.92	0.09
2012	9.02	0.09	(0.31)	(0.24)	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.697	1.000			
ρi	0.475	0.503	1.000		
gi	-0.443	-0.472	0.343	1.000	
θi	-0.076	0.106	-0.442	-0.647	1.000

BEST REGRESSION SUMMARY OUTPUT FOR INVESTMENT SEGMENT

Regression Statistics	
Multiple R	0.780
R Square	0.609
Adj. R Square	0.435
Standard Error	0.357
Observations	10.000

$$G_i = \beta_1 g_i + \beta_2 \rho_i + \varepsilon_i$$

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	2	1.588	0.794	6.222	0.028	0.972
Residual	8	1.021	0.128			
Total	10	2.608				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	0.491	0.144	3.398	0.009	0.158	0.823
gi	-0.309	0.129	-2.387	0.044	-0.607	-0.010

TABLE S9 - NSE SUMMARY DATA : 2003 - 2012 MANUFACTURING AND ALLIED SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2003	(1.80)	(0.63)	1.19	(2.67)	0.04
2004	7.16	1.08	1.18	2.94	0.03
2005	15.72	0.68	0.34	0.42	0.08
2006	18.89	0.38	0.54	0.10	0.07
2007	11.71	(0.37)	(0.24)	0.23	0.07
2008	17.66	0.59	(0.26)	(0.03)	0.08
2009	9.30	(0.37)	(0.39)	0.19	0.07
2010	18.18	(0.95)	0.75	(0.04)	0.04
2011	8.36	(0.41)	(0.27)	(0.97)	0.09
2012	8.23	(0.05)	(0.06)	0.21	0.13

CORRELATION 2003-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	0.232	1.000			
ρi	-0.276	0.127	1.000		
gi	0.336	0.670	0.064	1.000	
θi	0.128	0.033	-0.711	-0.109	1.000

BEST REGRESSION SUMMARY OUTPUT FOR MANUFACTURING SEGMENT 2003-2012

Regression Statistics	
Multiple R	0.670
R Square	0.448
Adj. R Square	0.337
Standard Error	0.487
Observations	10.000

$$G_i = \beta_1 g_i + \varepsilon_i$$

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	1	1.733	1.733	7.313	0.027	0.973
Residual	9	2.132	0.237			
Total	10	3.865				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
gi	0.319	0.118	2.704	0.024	0.052	0.586

TABLE S10 - NSE SUMMARY DATA : 2003 - 2012 TELECOMMUNICATION AND TECHNOLOGY SEGMENT

YEAR	P/E Y_i	GROWTH IN P/E G_i	GROWTH IN MPPS ρ_i	GROWTH IN EARNINGS g_i	91 - DAY T-BILL RATE θ_i
2008	20.74	(0.23)	(0.11)	0.53	0.08
2009	11.47	0.10	(0.17)	(0.24)	0.07
2010	12.84	0.22	0.84	0.43	0.04
2011	11.54	(0.21)	(0.32)	(0.05)	0.09
2012	10.12	(0.12)	(0.16)	(0.04)	0.13

CORRELATION 2008-2012

	Yi	*Gi*	*ρi*	*gi*	*ϑi*
Yi	1.000				
Gi	-0.365	1.000			
ρi	0.022	0.762	1.000		
gi	0.769	-0.022	0.569	1.000	
θi	-0.253	-0.669	-0.708	-0.424	1.000

BEST REGRESSION SUMMARY OUTPUT FOR TELECOMMUNICATION SEGMENT 2008-2012

Regression Statistics	
Multiple R	0.946
R Square	0.894
Adj. R Square	0.526
Standard Error	0.077
Observations	5.000

$$G_i = \beta_1 g_i + \beta_2 \rho_i + \varepsilon_i$$

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*	*Confidence level*
Regression	2	0.152	0.076	12.703	0.073	0.927
Residual	3	0.018	0.006			
Total	5	0.170				

	Coefficients	*Standard Error*	*t Stat*	*P value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
ρi	0.491	0.098	4.999	0.015	0.178	0.803
gi	-0.409	0.126	-3.235	0.048	-0.811	-0.007