Impact of Sustainable Growth on Stock Returns and Systematic Risk: An Empirical Study on Indian Manufacturing Firms

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Many thanks to my parents

For teaching me values

Declaration

I certify that this thesis titled "**Impact of Sustainable Growth on Stock Returns and Systematic Risk: An Empirical Study on Indian Manufacturing Firms**" is my original research work. This research work has not been previously submitted by me to any other University or Institute for award of any degree or diploma. Any material previously published or written by any other author included in the text has been duly acknowledged and referenced in this thesis.

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Certificate

This is certified that **Mr. Lalit Arora, Registration No.: 951013003**, has completed his Ph.D. thesis titled "**Impact of Sustainable Growth on Stock Returns and Systematic Risk: An Empirical Study on Indian Manufacturing Firms**" under my supervision. This Ph.D. thesis is an authentic research study carried out by him and it is being submitted to **L.M. Thapar School of Management, Thapar Institute of Engineering and Technology, Patiala**, for the award of the degree of **Doctor of Philosophy (Ph.D.)**. To the best of my knowledge, this research work has not been submitted to any other University or Institute for the award of any degree or diploma.

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Abbreviations used in the thesis

Abbreviations	Full form
ARDL	Autoregressive Distributed Lag
ASSETG	Asset Growth
ATO	Asset Turnover Ratio
BE	Book Value of Equity
BE/ME	Book-to-Market
BETA	Systematic Risk
CAPM	Capital Asset Pricing Model
CMIE	Centre for Monitoring Indian Economy
EBITDA	Earnings before interest, taxes, depreciation and amortization
EPS	Earnings per Share
FL	Financial Leverage
HHI	Herfindahl-Hirschman Index
IGR	Industrial Growth
IND CONC	Industry Concentration
INF	Inflation Rate
ME	Market Value of Equity
NI	Net Income
NPM	Net Profit Margin
NSE	National Stock Exchange
PAT	Profit after Tax
RESID	Residual of Regression Equation
ROA	Return on Assets
ROCE	Return on Capital Employed
ROE	Return on Equity
ROI	Return on Investment
RONW	Return on Net Worth
ROS	Return on Sales
RR	Profit Retention Ratio
SGR	Sustainable Growth Rate
SG	Sales Growth
SIZE	Market Capitalization
ST RET	Stock Returns
VAR	Vector Autoregressive

ABSTRACT

While traditional measures of a firm's success have focussed more on rubrics like sales and profitability, several firm managers, venture investors and researchers have come to acknowledge the need of contemporary and more appropriate measures of firm success due to the change the business environment has undergone in the last few decades. The hurdles and problems faced by businesses today are different from the challenges faced by firms say, two decades ago. Thus, identification of other more appropriate firm performance measures has received much attention of stakeholders, and measures like firm growth have come to be recognized as a superior measure of firm success.

The issue related to appropriateness of different growth measures as firm success parameters has been addressed by a number of researchers (Lockwood & Prombutr, 2010; Yao, Yu, Zhang, & Chen, 2011; Li, Becker, & Rosenfeld, 2012). Various studies have focused on growth related performance measures to address new metric needs. For example Cooper, Gulen, & Schill (2008) studied the impact of asset growth on stock returns. Buenafe, Bohnett, & Patrick (2009) studied the impact of economic growth on performance of firms. Long term output growth was found to have a significant positive relationship with stock performance (Lee, 1996). Undoubtedly, studies have provided a firm theoretical base to examine these relationships using past growth rates of firms. However, finance literature seems to lack substantially when it comes to an examination of growth that firm can achieve in the future. I seek to make a contribution with this effort to fill this gap in this growing literature base.

I built my effort to reconcile discussions related to the impact of different variables depicting firm performance on firm stock returns and risk. Since managers and investors are more concerned about the future growth prospects of firms, I add to the literature by incorporating a less used but no less important firm performance indicator in the form of Sustainable Growth Rate (SGR) to establish a relationship with stock returns and systematic risk. SGR is the "maximum rate at which a firm's sales can increase without depleting financial resources" (Higgins, 2007).

I built my methodological approach on studies describing the calculation of SGR. These include: Babcock (1970); Higgins (1977 & 1981); Johnson (1981); Jarvis, Mayo, & Lane (1992); Mayo & Jarvis (1992); Harkleroad (1993); Platt, Platt, & Chen (1995); Firer (1995); Ashta (2008); and Angell (2011). Though, the concept of SGR is not new and frequently appears in finance literature, it is yet to be systematically applied as a firm growth method. An effective and appropriate method of calculation of SGR remains elusive, and further examination of factors affecting this growth rate is required. I seek to address these issues by exploring the determinants of SGR and proposing a suitable method to determine this growth rate.

To the best of my knowledge, the literature on asset pricing (except Lockwood & Prombutr, 2010) has so far neglected the ability of SGR to explain stock returns and systematic risk. I provide systematic evidence to issues related to calculation of SGR and impact of this growth measure on firm stock returns and risk and these qualify as my major contributions to the literature. I examine the determinants of SGR and propose a suitable method of its calculation. Results suggest that Angell's (2011) formula considering key ratios like return on equity (ROE) and profit retention ratio (RR) is effective in capturing the variations in SGR. The results hold even after introducing industry specific factors like industrial growth and inflation in the regression equations. SGR calculated only on the basis of percentage change in book value of equity provides an aggregate view depicting that any changes in this growth rate across industries are random.

Many researchers contend the ability of accounting and macro economic variables to affect stock returns (Graham & Dodd, 1934; Gordon, 1962; Rosenberg, Reid, & Lanstein, 1985; Ou & Penman, 1989; Fama & French, 1992; Fieberg, Varmaz, & Poddig, 2016) and firms' systematic risk (Beaver & Manegold, 1975; Bowman, 1979; Hamid, Prakash, & Anderson, 1994; Hong & Sarkar, 2007; Rowe & Kim, 2010). Yet, existing literature has been unable to bring forth any evidence of the existence of a causal relationship between indicator of future growth potential in the form of SGR and firms' stock returns and systematic risk.

I have focused on a phenomenon that has escaped the notice of researchers up to this point. I demonstrate a suitable method of SGR calculation and highlight the factors affecting this growth rate. I also highlight the existence of a causal relationship of SGR with firm stock returns and systematic risk. By providing insight on how various aspects associated with firm growth are related to returns and risk, I add to existing literature on asset pricing. My study provides evidence that higher SGR firms tend to have higher stock returns. This means that SGR is adequately priced.

Key words: Sustainable growth, asset growth, stock returns, systematic risk, panel VAR model, manufacturing, India.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

A widely held view by corporate finance theoreticians is that the aim of a firm is to maximize wealth (Pfarrer, 2010). The aim of wealth maximization attracts considerable debate because of the proxies like profit maximization, societal welfare and growth. The underlying assumption is that an increase in any of these agents results in an increase in the value of the firm, and consequently, shareholders' value. Therefore, this issue has been found to fetch significant attention of managers and policy makers. There are numerous well-published empirical studies that attempt to establish the real determinants of stock returns, stock risk and ultimately, firm value (e.g. Ball & Brown, 1968; Gahlon & Gentry, 1982; Mandelker & Rhee, 1984; Bhandari, 1988; Sharma, 2006; Dimitrov & Jain, 2008; Gracia & Jorgensen, 2010; Trabelsi, 2013; Azmat, 2014).

Today, firm performance must be measured not only on traditional metrics but on those that reflect the changing imperatives and new metric knowledge. Metrics are useful if they reflect the environment of the item under measure (Ou & Penman, 1989). Thus, the focus of managers, investors and researchers is shifting from rubrics like sales and profitability to growth as a more appropriate measure of firm performance. Although traditional measures explain stock returns over a wide range of samples, they tend to be troublesome given their relatively similar variable specification – their inability to depict the growth potential of firms. A seminal research by Carton & Hofer (2006) addresses this potential concern and highlights that firm valuation may differ based upon individuals' assumptions about future actions and conditions. Thus, they stress on the need of a metric depicting growth potential of firm. Owning justification from this argument, I utilize Sustainable Growth Rate (SGR) as a measure of firm growth potential and operationalize this as a dynamic measure in my thesis.

Numerous studies are available on examination of growth related measures and their impact on firm performance. Cooper, Gulen, & Schill (2008) studied the impact of asset growth on stock returns. Buenafe, Bohnett, & Patrick (2009) studied the impact of economic growth on performance of firms. Long term output growth was found to have a significant positive relationship with stock performance (Lee, 1996). A generation of managers believe that a higher growth rate is better (Higgins, 1977). Yet, there is a caveat. A rapid growth rate requires the support of a huge investment in fixed assets. This may cause problems, especially in times of economic crisis when the firm may have to incur significant higher costs and debt burdens. My works focuses on alleviating this potential concern as I consider a realistic growth potential of firms and its impact on firm value and risk. I add to existing literature by providing a method to utilize SGR appropriately and examine its relationship with corporate stock returns.

SGR is the "maximum rate at which a firm's sales can increase without depleting financial resources" (Higgins, 2007). Higgins (1977) proposed a formula for calculating SGR for discrete time frameworks as a product of four important ratios, *viz*. profit retention ratio, net profit margin, asset turnover ratio and financial leverage (refer equation 1 in chapter 4). Normative growth parameters like sales growth and asset growth do not focus on the decomposition of managerial actions and the results that follow, nor do they signal the potential cash flow problems that firms may face in future. This leads to spectacular failures when it comes to commercialization of opportunities as firms face shortage of funds because of unrestrained growth.

SGR is a multifaceted metric that can be split into separate components or drivers that reflect the firm's retention policy, cost containment ability, asset utilization efficiency, and financing strategy, all of which are key determinants of firm performance (Lockwood & Prombutr, 2010). With an assumption that firms do not use any external equity financing, SGR is also calculated as year on year percentage change in book equity (refer equation 4 in chapter 4).

Analysis of SGR can provide a fairly comprehensive standard against which to benchmark performance; if actual growth is less than the SGR, the firm is underperforming. This is indicated in the sustainable growth equation:

$$SGR = b \times R \qquad \text{(i)}$$

Where:

- 'b' is the earnings retention rate; and
- 'R' is the return on equity.

This equation can further be modified as:

$$SGR = b \times (Earnings/\ Equity) \qquad \text{(ii)}$$

= b x (Assets/ Equity) x (Earnings/ Assets) (iii)

= b x [(Equity + Debt)/ Equity] x [Earnings/ Sales] x [Sales/ Assets] (iv)

= b x [1 + (Debt/ Equity)] x [Earnings/ Sales] x [Sales/ Assets] (v)

Segregating earnings retention ratio and leverage ratio as decisions and net profit margin and the asset turnover as results**,** Higgins (1977) formula offers a comprehensive insight into the process of maintaining equilibrium between sales increase and other financial policies of the firm. The decision components are statements of policy that reflect the outlook that managers, investors, and lenders have towards a firm's risks and prospects. The result components, on the other hand, reflect the result of managerial action, in other words, the operating performance. Inclusion of study of the impact of SGR on stock returns in this research provides constructive substantiation that investors may consider this forward looking factor while forming expectations.

Many view financial information as an essential tool for making useful investment decisions and reducing informational asymmetry between firm managers and investors (Hossain, Khan, & Yasmin, 2004). More than one historic viewpoint is provided by financial statements as evidenced in the study of Ou & Penman (1989). Nonetheless, these financial statements are of no significance if they show no relationship with firm value (Chandrapala, 2013).

Relevance and reliability are the basic parameters by which to define and measure the effectiveness of accounting information published by firms in their financial statements (Barth, Beaver, & Landsman, 2001; Francis, Schipper, & Vincent, 2003; Nayeri, Ghayoumi, & Bidari, 2012; Chandrapala, 2013; Sharma, 2014; Pervan & Bartulovic', 2014). Thus, the utility of accounting numbers to managers, researchers and investors lies in the sanctity of the method of calculation of accounting variables under consideration. Diverse accounting processes influence stock prices even though the actual cash flow outcomes of these processes remain same (Tinic, 1990).

Literature provides evidence related to significant differences in ways of defining and assessing SGR of firms (for example Babcock, 1970; Higgins, 1981; Ashta, 2008; Angell, 2011; Gardner, McGowan Jr., & Moeller, 2011). Yet these studies have proved to be elusive as they neither explore the suitability of the method to be used for calculating SGR, nor attempt to examine the various factors that determine this growth rate. This premise lies in the heart of my argument that there is a need of a firm theoretical base to examine SGR.

My investigation lies at the confluence of the concept of SGR and its ability to explain security returns and risk. The relationship between firm growth, shareholder equity and retained earnings is straightforward (as established by Lockwood & Prombutr, 2010) and lends significance to my examination. The growth rate of a firm stems from the return a firm makes on its shareholders' equity and the portion of its earnings that it reinvests into that equity. For calculating the growth of a firm in its 'true' sense, the firm is required to have a certain level of profitability. Growth in shareholders' equity over the long term drives the stock price. This mechanism paves the way for SGR to eventually contribute towards defining the firm's stock returns (value of the stock). Stock returns are undoubtedly a function of the rate of growth of expected corporate earnings. An increased return on equity leads to an enhanced level of retained earnings provided that the firm has sufficient growth opportunities. Retained earnings can then be utilized for multiple purposes, asset growth being one such important purpose.

(Li, Becker, & Rosenfeld, 2012) attributed the asset growth effect to mispricing or systematic risks. Their mispricing explanation suggests that investors' overreaction to a firm's information on asset growth by extrapolating past growth rates of assets to the future has been the reason why stock returns are affected by asset growth rates. The justification of systematic risk being explained by asset growth assumes that assets in place are less risky than growth options (Berk, Green, & Naik, 1999). Firms always use a mix of assets in place and growth options, making a change in this mix when investments are made in assets. The movement from growth options to assets in place reduces risk and affects subsequent returns. A simple explanation to this is that an enhanced level of assets in place results in increased revenues of firms in the form of sales growth. Anthony & Ramesh (1992) posit the response of stock returns to sales growth and capital investment made by firm. Firm growth and its impact on corporate stock returns and risk have been studied in varied dimensions in finance literature. In particular, drawing on the work in the field of asset pricing by (Fama & French, 1992), (Lockwood & Prombutr, 2010) and (Li et al., 2012), this study links stock returns and systematic risk to different growth measures of a firm.

By way of this report, I examine anomalies related to SGR calculation. Apart from this, I test the presence of predictability of returns and risk using SGR. My sample comprises

203 firms listed on the National Stock Exchange (henceforth NSE) of India from 1998 – 2014. To be consistent with my econometric models, I focus on firms spanning across nine industries in the Indian manufacturing sector [1]. Inclusion of financial data related to firms across different industries over a period of time brings in considerable heterogeneity in the units under consideration. The techniques of panel data estimation can take such heterogeneity explicitly into consideration by allowing for specific variables (Gujarati, Porter, & Gunasekar, 2013).

I found that the explanatory prowess of metrics proposed by Angell (2011) is effective in capturing the variations in SGR even after introducing industry specific factors like industrial growth and inflation in the regression equations. In contrast, SGR calculated only on the basis of percentage change in book value of equity (Babcock, 1970) provides an aggregate view depicting that any changes in this growth rate across firms are random. Analysis further provides evidence that net profit margin drives the sustainable growth of firms in the Indian manufacturing sector.

Note that the asset growth rate variables of cooper et al. (2008) appear to consistently have a superior return predictive power as compared to other variables. My study suggests that asset growth effect on stock returns is significantly explained by SGR. This is evident in the regression specifications discussed in the analysis part of this report. Empirical results of my study also suggest that the firms identified as having high SGR experience positive stock returns in the subsequent year. My results do not second the findings of Lockwood & Prombutr (2010) who argue that high SGR firms tend to have lower required returns.

I also address a related and equally important question of the implications of misaligned SGR and projected growth. I do this by way of linking SGR to systematic risk of firms. I present a concrete picture of what a change in growth can capture in its relation to a firm's systematic risk. My results hold up with important results of Anthony & Ramesh (1992); Berk et al. (1999) and Li et al. (2012) who argue in favour of a positive relationship of asset growth and sales growth with firm betas. I also provide evidence of the ability of growth related measures to cause variations in firm betas.

The contribution of my research to existing theory is significant and manifold. First, my research takes a different approach by analyzing the various firm level (internal) and industry level (external) determinants of SGR in a single study. To the best of my knowledge, this is the first study to examine SGR considering these aspects. Second, I demonstrate the appropriateness of methods of calculating SGR. The results will lead to clarity on SGR calculation for all future financial research. My study includes a re-assessment of SGR formulas proposed by various authors (e.g. Babcock, 1970; Higgins, 1977 & 1981; Johnson, 1981; Jarvis, Mayo & Lane, 1992; Mayo & Jarvis, 1992; Harkleroad, 1993; Platt, Platt, & Chen, 1995; Firer, 1995; Ashta, 2008; Angell, 2011) and my recommendations would help improve the efficacy of the existing SGR models. Third, no empirical study has been hitherto conducted to test the lead-lag relationship of SGR with stock returns. Lockwood & Prombutr (2010) test it to a limited extent. I address this concern and find that SGR of the firms under consideration is adequately priced. Fourth, I document that firm betas significantly correlate with SGR. My findings indicate that growth decisions require careful examination as growth in assets and sales is found to enhance risk.

My research also equips managers and investors with a tool to investigate potential industry success. Results indicate that SGR of firms operating in a specific industry is affected by industrial growth. Though this is not the focus of the study, the results provide inputs related to the reasons behind variations in the growth rates among firms in different industries. A comparative analysis of SGRs across different industries in the Indian manufacturing sector offers a basis for studying various factors contributing towards the sustainable growth of firms. Thus, SGR can prove to be a benchmark for other firms to perform on similar lines.

The remainder of the thesis is structured as follows: Chapter 2 of the thesis describes the rationale and objectives of the study. Chapter 3 contains linkages with existing literature. Theoretical background and testable hypotheses are presented in Chapter 4. Econometric methodology including measurement of variables, and structure and sources of data has been discussed in Chapter 5. Results of econometric analysis have been presented in Chapter 6 followed by a related discussion in Chapter 7. The study concludes in Chapter 8 where limitations and directions for future research are discussed.

CHAPTER 2

RATIONALE AND OBJECTIVES OF THE STUDY

The importance of SGR in financial decision making is well established. Seminal (Babcock, 1970; Higgins, 1977) and recent advances (Angell, 2011) in finance literature have highlighted SGR as an important tool for managers and investors to foresee any potential cash flow problems that firms may face in future. I highlight important aspects related to this growth rate which require careful examination. Staying close to the classical SGR model specifications, the primary aim of my study is to examine the determinants of SGR and the impact of this growth rate on stock returns and firm beta. I also calculate SGR using two different methods and compare to see if there are significant differences in the results of the two methods used. Use of panel data regression analysis (fixed effect model and random effect model) allows for identification of a suitable formula for calculation of SGR.

There are several studies that discuss the methods of calculating SGR (e.g. Babcock, 1970; Higgins, 1977 & 1981; Johnson, 1981; Platt et al., 1995; Firer, 1995; Ashta, 2008; Angell, 2011; and Gardner et al., 2011). A study by Jarvis et al. (1992) depicts the utility of the concept of SGR in differentiating industries and picking a front runner industry for receiving government funding. However, a study which discusses the internal (firm level) and external (industry level) factors that influence this growth rate is missing in the literature. The first aspect of present research addresses to bridge this theoretical gap. In a nut shell, my aim is compare SGR calculated using ROE and profit retention ratio to its comparable calculations using percentage change in book value of equity. In doing this, I also examine the determinants of SGR.

The second aspect of my discussion involves asset pricing. The diverse opinion of theorists led to an examination of various factors that have an impact on stock returns of the firms (Ou & Penman, 1989 discussed P/E ratio; Fama & French, 1992 discussed BE/ME and firm size; Lee, 1996 discussed long term output growth; Michou, 2013 discussed BE/ME and ME/BE ratios; Obreja, 2016 discussed leverage). With various researches providing different results, the restrictions and limitations to the manner in which these factors render accountability is questionable. By and large, literature on asset pricing is weighted in the direction of developing empirically testable models using past performance indicators of firms. Numerous empirical studies explore various accounting variables having an impact on stock returns (Ball & Brown, 1968; Gahlon & Gentry, 1982; Bhandari, 1988; Habib, 2004;

Dimitrov & Jain, 2008; Gomes & Schmid, 2010; Gracia & Jorgensen, 2010). A relationship between earnings and value of common stock was extensively hypothesized by valuation theory (Beaver, 1968). Little theoretical consideration has been given, and practically no empirical efforts committed towards examining the determinants that indicate the future growth potential of firms. In contrast, the present study involves a discussion on the role of a future oriented growth measure in the form of SGR in explaining stock returns of firms.

To better understand the growth-return relationship, a careful and multidirectional anatomy of these variables must be conducted. If a firm is consistently growing with time, it should have a positive impact on its stock prices. A growing firm is able to provide good dividends to its shareholders. Also, if a firm has good profits, it can invest its retained earnings on business expansion. The growing firm not only enjoys increasing profits, but also gains business reputation, brand value and market share in the industry. Thus, shareholders of such firms not only hold their existing shares, but also seek to buy more shares of these firms. As a result, prices of the shares increase, thereby increasing the shareholders' wealth. Cross sections of stock returns have provided evidence of the existence of a significant relationship between stock returns and variables like firm size and book-to-market (Fama & French, 1992) and leverage (Bhandari, 1988). Basu (1983) highlighted earnings to price ratio as a very strong predictor of expected returns in the US market. Book-to-market, earnings-to-price, firm size and leverage include a market value component by their very nature. Thus, believing that these attributes do not suffer from investor sentiment or mispricing is an unrealistic assumption (Lockwood & Prombutr, 2010). Investor sentiment and mispricing can cause randomness in the results obtained by various authors over varied time periods. The concept of SGR allows constraining this randomness and gives a limited but significant ability to predict stock returns due to the fact that it does not contain a market value component. In comparison to other benchmark determinants of stock returns, SGR effect offers constructive empirical outcomes. Dynamic turnover of assets (Berk et al., 1999) was found to have a strong association with systematic risk and expected returns. In order to determine the robustness of my results, I include well established measures of firm growth in the form of asset growth (Cooper et al., 2008) and return on assets in the regression model.

Since, growth is an important but not the only condition to firm success, the objective of firms to pick up the pace of growth requires attention towards the ability of growth to render accountability towards explaining stock returns in a time varying set up. In a panel set up of firms across varied industries, my study provides evidence of a strong relationship between SGR and stock returns. Since growth is not an instantaneous phenomenon, a study of the growth and returns considered for the same year may not provide an adequate justification of the existence of this relationship. Hence, I test a lead-lag relationship using autoregressive distributed lag (henceforth ARDL) model and examine the linkage between growth measures and stock returns. As stock returns are volatile and non stationary, the degree of their stability also varies across time and cross sectional units. I address this challenge by pooling in data and using a panel data set within my analytical framework.

Third aspect of my research illustrates a connection between SGR and firm beta. Durand (1957) appears to be the first author to bring to light the causal relationship among corporate growth variables and risk. This relationship was further explored by Bowman (1979) who challenged the existence of any significant relationship between systematic risk and growth of the firm. Nonetheless, his growth measures were either growth as 'opportunities for investment in projects with an expected return higher than that of the existing firm', or growth as 'opportunities for 'investment in projects yielding excess returns'. The study by Hong & Sarkar (2007) used a meaningful proxy for growth (market-to-book ratio) to determine the beta for firms. Koussis & Makrominas (2015) found that higher beta was associated with higher return volatility, lower book-to-market ratio, lower return on assets, higher operating and financial leverage, and larger market capitalization (Size). Berk et al. (1999) provided evidence of systematic risk being explained by asset growth. They linked dynamic turnover of assets in place with lower levels of systematic risk and expected returns. Growth has a clear impact on firms' systematic risk. The movement from growth options to assets in place reduces risk. A simple explanation for this is that an enhanced level of assets in place results in increased revenues of firms in the form of sales growth. Growing firms feel greater shocks of economic activities around them, as the money at stake increases. Thus, growth seems to be a reasonably powerful influencer of the level of systematic risk of firms.

On the basis of the discussion above, the objectives of the study may be listed as follows:

1. To examine the approaches of calculating sustainable growth and analyzing the impact of its determinants.
2. To investigate the impact of sustainable growth on stock returns of the firm.
3. To investigate the impact of sustainable growth on systematic risk of the firm.

Thus, my study explores an important aspect of firm's growth in the form of sustainable growth. I accommodate three important issues. First, I evaluate of the methods of calculating SGR along with the analysis of its determinants. Second, I probe an empirical association of SGR with stock returns of the firm. Third, I appreciate the relationship of SGR and firm beta.

In order to justify the rationale and objectives of the study, it is important to review available literature extensively for exploring the relevance of the variables to be included in econometric analysis. Chapter 3 provides a review of existing literature on SGR. Studies highlighting the concept and examining the approaches of calculating SGR will be highlighted. Studies incorporating the impact of various accounting and macroeconomic variables on stock returns and systematic risk of the firms will also be highlighted over a period of more than four decades.

CHAPTER 3

REVIEW OF LITERATURE

Existing literature has proposed numerous measures of SGR which tend to be conflicting. Motivated by the fundamental disagreements of authors related to SGR calculation, this chapter highlights that the conflict does, in fact, exist. The roots of my evaluation of SGR models go back to Babcock (1970). My work also connects to literature relating asset prices and systematic risk. In subsequent sections, I highlight various studies related to the calculation of SGR. I also highlight studies which discuss the association of a variety of accounting and macroeconomic variables with stock returns and systematic risk of the firms.

3.1 SGR: concept and approaches for calculation

Growth in any form is virtually treated as an optimum unique component of firm performance. There is no lack of research on relevance and importance of growth. Long term output growth (Lee, 1996), growth in capital investments (Titman, Wei, & Xie, 2004), asset growth (Cooper et al., 2008) and economic growth (Buenafe et al., 2009) have been found to have a significant relationship with stock returns. Lakonishok, Shleifer, & Vishny (1994) found a negative relationship between stock returns and prior growth rate in sales. The concept of SGR may be traced back to the study by Babcock (1970) wherein a simple explanation of the behaviour of various elements of SGR was provided. This concept was later developed by Higgins (1977) who highlighted the signs of increasing unpleasant financial circumstances when there was unrestrained growth in a firm. Higgins (1977) study of sustainable growth was further established by Johnson (1981) through the classification of the behaviour of assets and liabilities in an inflationary environment. Platt et al. (1995) extended Higgins (1977) study of SGR to firms in financial distress and developed a formula that described how much growth could be achieved if firms did not borrow from the market to maintain a target capital structure. Under such circumstances, they proposed to estimate SGR simply as a product of profit margin and turnover of assets. The problem of SGR operationalization and its calculation has been addressed by many authors including Firer (1995), Ashta (2008), Angell (2011) and Gardner et al. (2011). Jarvis et al. (1992) highlighted the utility of the concept of SGR in rationally picking up specific industries for special attention and assistance from the government. Their study identified how each constituent of SGR model was affected by specific types of government economic development programs. Further, the study extended the use of SGR at a macroeconomic level, thus setting priorities among industries. Examining the association between SGR and inflation, Higgins (1981) concluded that in the absence of taxes, inflation had no effect on real SGR. Mayo & Jarvis (1992) highlighted the variations in SGR due to the difference in the relative mix of tangible and intangible assets in service firms and industrial firms. Phillips, Anderson, & Volker (2010) found evidence of a significant relationship between sales growth and SGR when they differentiated privately held retail companies on the basis of growth cycle stages in terms of SGR. Lockwood & Prombutr (2010) illustrated the importance of SGR in explaining subsequent stock returns. Of the four components of SGR, they found net profit margin as the major determinant of subsequent returns.

Literature also provides evidence of the impact of industry wide factors on firm performance. In this context, industry advertising expenditure (Comanor & Wilson, 1967 and Sherman & Tollison, 1971); and size and profitability (Marcus, 1969, Shephard, 1972 and Amato & Wilder, 1985) are the important variables that have received attention of researchers. However, these studies assumed an identical impact of independent variables on performance of firms even though these firms operated in different industry groups. Bass, Cattin, & Wittink (1978) for the first time statistically proved a need for industry level analysis for such examinations. Hou & Robinson (2006) provided useful evidence of the impact of industry specific factors on firms' performance. Missing from literature is an empirical investigation of determinants of SGR with a primary financial assumption of heterogeneity of different industrial groups.

Macroeconomic environment influences the effectiveness of firms' strategic choices (Shama, 1978). Since SGR comprises of firms' operating and financial elements in principle, it should be correlated with the growth of a particular industrial sector (measured by index of industrial production in this study). Given adequate growth opportunities, newly acquired assets are viewed as a use of funds while retained earnings and new borrowing as the two financing sources (Platt et al., 1995). Though long term issuance of debt is a conscious or discretionary decision of firms, the credit extended to a particular industry (gross bank credit in this study) can spontaneously increase the growth prospects of firms within that industry. Another significant macroeconomic variable that cannot be sidelined while considering determinants of SGR is inflation (Higgins, 1981). In their study, Hou & Robinson (2006) proposed that both industry as well as individual stock returns varied with the level of industry concentration. They explicitly focused on the need of incorporation of industry specific factors in asset pricing models. In a similar argument, Purkayastha (2013) claimed the importance of industry effects. He attributed this to the differences among industries due to their different stages of development. MacKay & Phillips (2005) concluded that firms' financial structure depended on industry type. They reported a higher financial leverage in concentrated industries. Since the concept of SGR calls for a stable financial structure, my study assumes that highly concentrated industries should command higher SGR. Gupta (1969) reported patterns in important financial ratios like asset turnover ratio, asset productivity and return on net worth due to inter industry variations. Platt & Platt (1991) recommended models considering industry relative specifications to be more accurate and stable in terms of their predictive performance. I apply a different approach in my study. Since, growth is a dynamic phenomenon; its occurrence cannot be presumed to take place due to isolated impact of its determinants. Hence, apart from addressing SGR model comparison issue, I incorporate both internal (firm level) and external (industry level) variables concurrently and examine their impact on SGR.

3.2 Universal determinants of stock returns

Examinations of the ability of different accounting and macroeconomic variables to predict stock returns have provided varied results. The roots of the role of elementary factors in shaping share prices date back to the study by Graham & Dodd (1934). The dividend discount model proposed by Gordon (1962) was another effort in the same direction. A more dynamic investment framework involving the application of multiple pieces of information from the financial statements of firms was suggested by Ou & Penman (1989). The debate surrounding stock return predictability is reflected by two main dimensions. The first major dimension (the second dimension is discussed in section 3.3) arises from the correlated movement of stock returns with firm size (market equity) and book-to-market (Fama & French, 1992). In this context, book-to-market had a considerably stronger role as compared to firm size. Stattman (1980) and Rosenberg et al. (1985) also documented a positive association of average returns with book-to-market ratio. These studies have been supported by more recent studies such as the one by Demir, Fung, & Lu (2016) who argued that volatility of stock returns to changes in BE/ME is limited for large capitalization stocks but is significant for small-growth and small-value stocks. Fieberg et al. (2016) also tested the ability of well known characteristics like book-to-market, size and momentum to explain stock returns and concluded that widely accepted factors like small minus big (SMB), high minus low (HML) and winners minus losers (WML) were not significantly priced. The size effect of Banz (1981) was an attempt to unite the available substantiations in opposition to the Sharpe-Lintner-Black (SLB) model. The size factor in earnings was documented as a useful tool to explain stock returns (Fama & French, 1995). Size has also been associated with profitability. Weak firms with lower levels of profitability tend to have high BE/ME ratio while strong firms with persistent earnings capacity have low BE/ME ratio. Michou (2009) showed that the extrapolative influence of book-to-market and market-to-book spreads depends on the portfolio creation approach and the relative proportion of small-cap, large-cap, value and growth stocks in the portfolio. Obreja (2013) linked operating leverage to both premium and book-leverage premium in stock returns and observed that an economically significant operating leverage for value firms resulted in high equity risk premiums.

Despite growing asset pricing literature, it seems difficult to describe a single financial variable or ratio that might capture multiple aspects of a firm. Thus, while evaluating any asset pricing model, researchers construct composite indicators using various types of financial information (Aggarwal & Gupta, 2016). A study by Das & Pattanayak (2013) examined sixteen explanatory variables extracted from the financial statements of firms. The variables were then grouped into six rationally meaningful categories *viz.*, ROI factor (price-to-book, ROCE, RONW, gross sales); earning power factor (EPS, book value per share); stock valuation factor (price-earnings ratio, price-cash earnings ratio); risk factor (debt/equity ratio, PAT/net assets ratio); volatility factor (beta and standard deviation); and growth factor (dividend yield and market capitalization to sales). Florou & Chalevas (2010) reported the ability of aspects like operating performance, growth opportunities with the firm, and capability of firm to generate profits from sales, in affecting stock returns. Among the measures of operating performance, their study reported EBITDA as the main driver having a positive association with stock returns. MV/BV (as proxy of growth and capability of firm to generate profit from sales) - measured as return on sales (ROS) was found to have a positive association with stock returns. Goyal & Welch (2006) argued that none of the conventional variables (accounting information variables) used to explain stock returns had been able to beat a simple prediction based on historical average stock returns. However, contradictory results were reported by Campbell & Thompson (2008) who obtained a small but economically significant power of dividend-price ratio, earning-price ratio, smoothed earning-price ratio and book-to-market ratio to forecast future returns.

The significance of conventional variables (highlighting past firm performance) in predicting stock returns is arguable. My framework differs. I deviate from a historic approach and propose that a future oriented parameter of firm performance (in the form of SGR) provides meaningful inferences.

3.3 Growth related aspects and stock returns

The second dimension of literature related to stock returns predictability emerges from the expected function of markets in efficient pricing of real investments (Cooper et al., 2008). With firms acquiring and disposing off their assets, it becomes relatively important to examine the role of these variations in predicting stock returns. Cooper et al. (2008) asserted that events associated with asset expansion were followed by periods of low returns where as events associated with asset contraction triggered higher returns. Li et al. (2012) argued in favour of strong return predictive power of asset growth related measures. Their study confirmed negative relationship between growth in assets and subsequent returns. Increase in capital investment was found to result in negative benchmark returns by Titman et al. (2004). Anthony & Ramesh (1992) documented the level of association between sales growth and stock returns and found a negative relationship between the two. In a study closely related to my research, Lockwood & Prombutr (2010) attributed sustainable growth effect to risk rather than mispricing. They proposed that high sustainable growth firms should have low default risk, lower book-to-market ratio and thus, settle for lower subsequent returns. Yao et al. (2011) reported a pervasive negative relationship between asset growth and stock returns. Their study, however, was more inclined towards an examination of asset growth and stock return relationship with respect to external factors like bank financing.

Evidence of linkage of stock returns with macroeconomic factors like output growth and inflation was provided by McMillan (2014). He argued that these variables acted as significant and important mediators in the returns-dividend relationship. Henry, Olekalns, & Thong (2004) found another record using same set of variables with a reversed causal pattern. Their study confirmed the existence of a significant capacity of returns to predict growth. Mauro (2000) reported a strong association between lagged stock returns and output growth. He proposed that asset prices held valuable information that could be used to anticipate output, while Tse (2015) examined an association between industry returns and stock returns. Revaluation amounts (tax benefits) of fixed assets were found to be statistically significant in explaining stock returns (Ghicas, Hevas, & Papadaki, 1996). Nelson (2006) proposed a model using intangibles of a firm as a refined version of three factor model (which fails to explain returns on portfolios formed by industry and exchange) to explain stock returns of firms. A recent study by Koijen, Lustig, & Nieuwerburgh (2017) illustrated that the factor predicting future U.S. economic activity by way of the slope of bond yield curve is priced in the cross-section of the U.S. stock returns.

Figure 3.1: Highlights of review of literature (1970-2016) on the concept of SGR and various asset pricing theories

Author	Year	Variables Used	Finding
Babcock, G.C.; Higgins, R.C.	1970; 2007	Retention ratio, net profit margin, asset turnover and financial leverage	Highlighted the concept of SGR and discussed its components
Stattman, D.; Rosenberg, B., Reid, K., & Lanstein, R.; Fama, E.F. & French, K.R.	1980; 1985; 1992	Book-to-market & stock returns	Positive association of book-to-market and stock returns
Banz, R.W.; Fama, E.F. & French, K.R.	1981; 1995	Firm size & equity returns	Firms with low market equity earn higher returns
Basu, S.	1983	Earnings to price & expected returns	Value stocks earn higher returns than growth stocks
Bhandari, L.C.	1988	Leverage & asset prices	Stock returns are positively related with leverage (debt-ratio) of the firms
Anthony, J.H. & Ramesh, K.	1992	Sales growth & stock returns	Negative relationship between sales growth and stock returns
Ghicas, D.C., Hevas, D.L., & Papadaki, A.J.	1996	Fixed asset revaluations & stock returns	Positive association of fixed asset revaluations & stock returns in some years
Titman, S., John Wei, K.C., & Xie, F.; Anderson, C.W. & Gracia-Feijoo; Xing, Y.	2004; 2006; 2008	Capital expenditure & stock returns	Increase in capital investment results in negative benchmark returns
Hou, K. & Robinson, D.T.	2006	Industry concentration & stock returns	Concentrated industries command lower returns
Nelson, J.M.	2006	Intangible assets & stock returns	Recommends intangibles model to be better than the three factor model
Cooper, M.J., Gulen, H., & Schill, M.J.; Yao, T., Yu, T., Zhang, T., & Chen, S.; Li, X., Becker, Y., & Rosenfeld, D.	2008; 2011; 2012	Asset growth & stock returns	Negative association of asset expansion and stock returns
Nguyen, G.X. & Swanson, P.E.	2009	Relative efficiencies & stock returns	Negative association between operating efficiency and stock returns
Lockwood, L. & Prombutr, W.	2010	SGR & stock returns	SGR and stock returns are negatively associated
Angell, R.J.	2011	Return on equity & profit retention ratio	Demonstrated the errors in computation of SGR
McMillan, D.G. & Wohar, M.E.	2013	Dividend yield & stock returns	Ability of dividend yield in predicting stock returns varies with time
Friewald, N., Wagner, C., & Zechner, J.	2014	Credit risk premia & stock returns	Increase in credit risk premia cause stock returns to increase
Tse, Y.	2015	Industry returns & stock returns	Positive association between industry returns and stock returns
Heerden, J.D.V. & Rensburg, P.V.	2016	Liquidity & stock returns	Size and momentum effects are sensitive to the level of sample liquidity. The value effect is however robust

Source: Author's own compilation. Studies have been compiled in chronological order to highlight developments in the area of asset pricing.

3.4 Growth, systematic risk and firm value

The association between market betas and a variety of specifications such as accounting information and macroeconomic environment of firm has long attracted attention of researchers (refer Beaver & Manegold, 1975; Bowman 1979; Hamid et al., 1994; Hong & Sarkar, 2007). Fewings (1975) investigated the impact of corporate growth on risk of common stocks. He found risk to be a positive function of growth in total expected corporate earnings. Contradicting results were brought forth by Bowman (1979), who found no significant relationship between earnings variability, growth, size or dividend policy with systematic risk. Hamid et al. (1994) found no empirical evidence of an inter-relationship between growth rate and relative systematic risk of firms. Among several variables examined, Rowe & Kim (2010) found only market capitalization to have a significant positive impact on beta. These results were robust across varying time periods before and after the recession of 2007. Among other non-significant variables were returns on assets, liabilities as a percentage of assets, asset turnover, quick ratio and EBIT growth rate.

So & Nyerges (1995) described multicollinearity among variables like dividend payout, leverage and size as the major reason of their insignificant relationship with systematic risk in a multivariate analysis. Li et al. (2012) on analyzing the relationship between asset growth and future returns, found the predictive power of two year asset growth rates to be more than one year asset growth rates. Assets in place were found to be less risky as compared to asset growth options (Berk et al., 1999). This resulted in asset growth leading to a reduced level of risk to firms. Lev (1974) provided evidence of a positive relationship between beta and operating leverage. Anthony & Ramesh (1992) attempted to gauge the level of association between sales growth and stock prices. Brick, Chen, & Lee (2014) highlighted a significant influence of systematic risk on sales growth rate estimation. Literature provides evidence that size and book-to-market ratio act as proxies for systematic risk, thereby affecting stock returns (Berk et al., 1999). Gomes, Kogan, & Zhang (2003) examined the riskiness of growth options in comparison to assets in place. They argued that size and book-to-market were associated with true conditional betas. Conflicting conclusions were arrived at by Fewings (1975) and Myers & Turnbull (1977) regarding the effect of growth on risk as measured by beta. While Fewings (1975) argued in favour of a positive relationship between growth and risk, Myers & Turnbull (1977) laid stress on a decreasing beta with an increasing growth rate.

Figure 3.2: Highlights of review of literature (1957-2016) on the accounting determinants of beta (systematic risk)

Author	Year	Variables Used	Finding
Durand, D.	1957	Growth stocks	Positive association between growth and risk
Lev, B.	1974	Operating leverage	Positive relationship between risk and operating leverage
Beaver W. & Manegold J.	1975	Accounting betas & market betas	Market betas are more reliable than accounting betas
Fewings, D.R.	1975	Corporate growth (capitalization rate)	Positive relationship between risk and capitalization rate
Myres, S.C. & Turnbull, S.M.	1977	Project life, expected cash flows	Positive relationship between beta and project life, expected cash flows
Hamid S., Prakas A.J., & Anderson G.A.	1994	Growth in dividends and earnings	Positive relationship between growth in dividends, earnings and risk
So, J.C. & Nyerges, R.T.	1995	Dividend payout, leverage and size	No significant relationship with risk
Chen, F. & Zhang, F.	1998	Financial leverage and uncertain earnings	Positive relationship between financial leverage, uncertain earnings and risk
Berk, J.B., Green, R. C., & Naik, V.	1999	Asset growth	Positive relationship between asset growth and risk
Gomes, J.F., Kogan, L., & Zhang, L.	2003	Growth options and assets in place	Growth options are more risky/ association of size and book-to-market with betas
Campbell, J. Y., Polk, C., & Vuolteenaho, T.	2005	Beta and growth & value companies	Betas are determined by cash flow fundamentals
Hong G. & Sarkar, S.	2007	Firm characteristics, growth opportunities & macroeconomic variables	Equity betas are non stationary, volatile and varies across firms and time
Li, EXN., Livdan, D., & Zhang, L.	2009	Asset growth	Ability of systematic risk to explain asset growth
Jacquier, E., Titman, S., & Yalçin, A.	2010	Operating leverage and financial leverage	Positive relationship between operating/ financial leverage and risk
Lockwood, L. & Prombutr, W.	2010	Sustainable growth rate	Sustainable growth effect is negatively associated with risk
Rowe, T. & Kim, J.	2010	Market capitalization	Positive relation between market capitalization and risk
Brick, I.E., Chen, H.Y., & Lee, C.W.	2014	Sales growth estimation	Significant influence of systematic risk on sales growth estimation
Koussis, N. & Makrominas, M.	2015	Return volatility, book-to-market, return on assets, operating and financial leverage	Higher beta associated with high volatility, low BE/ME, low ROA, high OL, high FL and large ME
Savor, P. & Wilson, M.	2016	Earnings announcement	Exposure of announcement risk is priced

Source: Author's own compilation. Studies have been compiled in chronological order to highlight developments in the area of study of the determinants of beta.

Additionally, the assumed set of empirical ‘‘risk factors’’ has been increasingly augmented to take account of (without being limited to) such variables as momentum, liquidity, capital investment and return on assets (ROA) (Koussis & Makrominas, 2015).

Friewald et al. (2014) explored firm risk in the form of credit risk. They argued that an increase in credit risk premia of firms caused their stock returns to increase. They extended the Merton (1974) model to establish a link between stock returns and credit risk. A similar model was used by Vassalou & Xing (2004) where they constructed a market based measure for physical default probability and concluded that higher returns were claimed by distressed stocks. In a recent study by Savor & Wilson (2016), earnings announcement premium was found to be positively associated with the level of systematic risk of the firms, thus concluding that exposure to announcement risk was priced.

The conclusion that emerges from the literature review is that at present there is a scarcity of theories describing the manner in which SGR varies. This variation can be attributed to the basic internal (firm level) and external (industry level) influences that firms generally experience. It is also apparent that while literature on past performance of firms and its impact on stock prices is significant, literature on the relationship between returns and future growth potential of firms is comparatively less. Owing to this important aspect, it becomes essential to assess the utility of SGR in explaining subsequent returns and firm betas. The above discussion leads to the development of hypotheses (discussed in chapter 4) for this study. Chapter 4 will provide a detailed discussion on the various theories developed for SGR calculation and the empirical results of different studies on asset pricing over time.

CHAPTER 4

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

I hypothesize relationships in this chapter based on the literature review as given in chapter 3. The concept of SGR may be traced back to the study by Babcock (1970), and has since helped managers greatly in taking major corporate financial decisions. The phenomenon is well understood and has been used extensively to differentiate firms and industries over time. However, the factors affecting this growth rate have remained unexplored. I raise the bar by conducting an examination of internal and external factors determining this growth rate. My approach can be useful to practitioners in balancing their operational and financial strategies as per the changing internal and external environment of firm. Using the same theoretical basis as proposed by Higgins (1977), which used four key ratios, different studies have highlighted the variability in the calculation of SGR. Higgins formula for sustainable growth for discrete time frameworks uses four important ratios as shown below:

$$SGR = RR \times NPM \times ATO \times FL \quad (1)$$

Where:

- RR is the profit retention ratio calculated as retained earnings divided by net income;
- NPM is the net profit margin calculated as net income divided by sales;
- ATO is asset turnover calculated as sales divided by total assets; and
- FL is financial leverage calculated as total assets divided by book equity.

Different combinations of components of SGR provide useful information. Net profit margin times asset turnover equals return on assets and return on assets times financial leverage equals return on equity. A simplified version of the above stated formula can thus be established:

$$SGR = ROE \times b \quad (2)$$

Where:

- ROE is return on equity; and
- ‘b’ denotes profit retention ratio.

An important note to be made here is that profit retention ratio, net profit margin, asset turnover and financial leverage have been calculated using year-end values of the required accounting information. However, this is just a convention to make things easier. There seems to be a lack of consensus among experts on how to calculate SGR. While some studies (for example, Keown, Martin, & Petty, p. 221 or Brealey, Myers, & Marcus, p. 95) calculate SGR as SGR = ROE × b, where b is the profit retention rate or (1- the payout rate), others (Ross, Westerfield, & Jordan, p.1-3 or Cornett, Adair, & Nofsinger, p.87) use the formula as stated in equation 3. None of the formulae are incorrect if allowance is made for the different assumptions behind the calculation of ROE. If ROE (NI/Equity) is calculated using beginning equity [2], the correct calculation for the SGR is ROE × b. However, if ROE were to be calculated using ending equity, then the correct calculation for the SGR would be ROE × b/ [1- (ROE × b)]. In agreement with the components (ROE and retention ratio) but with a slight modification, Angell (2011) addressed the nature and magnitude of errors that could be generated using the Higgin's (1977) formula for SGR. In light of his argument, I propose the following formula for calculating the SGR (referred to as SGR (I) i.e. SGR calculated using the first method) of firms in the Indian manufacturing sector:

$$SGR\ (I) = ROE \times b / [1- (ROE \times b)] \qquad (3)$$

The components of ROE (net profit margin, asset turnover and financial leverage) are of crucial importance. However, their inherent characteristics may render their reliability doubtful for a sustained growth over a long period. The competitive nature of the market does not allow firms to continue with their margin improvements. Hou & Robinson (2006) provide evidence that concentrated industries command lower returns. Similarly, asset turnover varies with the level of technology and operational efficiency of a business (Nguyen & Swanson, 2009). Financial leverage defined as total assets divided by book equity extracts a value which depends on the investment options available to the firm and its ability to use its equity base to finance the required capital expenditure (Titman et al., 2004; Anderson & Garcia-Feij´oo, 2006 and Xing, 2008). As a result, these ratios may present a distorted picture of the actual SGR. This issue related to the unexpected variability of these components was addressed by Babcock (1970). He argued that the only sustainable component of firm growth is change in book equity and it seems to correlate with the performance of the stock in terms of capital appreciation. Babcock considered change in book equity as the only sustainable source to fund growth in a firm. Putting matters into perspective, SGR is also calculated as year on year percentage change in book equity (refer equation 4). The fundamental assumption underlying such SGR equation is that firms do not use any external equity financing. SGR calculated with this method is referred to as SGR (II) in this study for calculating SGR of firms using method II which can be stated as:

$$SGR\ (II) = [BE_t / BE_{t-1}] - 1 \qquad (4)$$

Equation (4) is an alternative formula for calculating SGR. However, there is a caveat. Book value of equity is increasingly being reported as a negative number. This opposes the limited liability structure of firms which proposes that shareholders' value cannot be negative (Brown, Lajbcygier, & Li, 2008). The results of the study by Collins, Pincus, & Xie (1999) also do not support the role of book value of equity as a control for scale differences. Rather, their results provide evidence that book value of equity serves as a proxy for expected future normal earnings, specifically for loss making firms. These arguments make sense as just a given percentage change in book value of equity will not inform about profitability, efficiency and leverage of firms. The results of studies mentioning the formula for calculating the SGR are mixed. I seek to overcome this pitfall by testing the hypothesis given below. This hypothesis has been formulated in order to achieve my research objective of examining the two approaches of calculating SGR and also analyzing the impact of its determinants:

Hypothesis 1: *Change in book value of equity does not act as a significant measure of sustainable growth.*

A consistently growing firm experiences a positive impact of growth on its stock prices. Growing firms provide good dividend to their shareholders. In case a firm has good profits, these profits can be reinvested for business expansion. The growing firm not only enjoys increasing profits but also gains business reputation, brand value and market share in the industry. Due to this, the shareholders of such firms not only hold their existing shares, but also seek to buy more shares of these firms. As a result, prices of the shares of the firms increase, thus increasing shareholder wealth.

Literature highlighting the variables affecting shareholder wealth is extensive. The role and effectiveness of variables like firm size and book-to-market (Fama & French, 1992) and leverage (Bhandari, 1988) in explaining stock returns and risk is well established. Basu (1983) emphasized earnings to price ratio as a very strong contender in explaining cross section of expected returns in the US market. The rate of return on equity is levered with some combination of debt and equity in the total capital (Babcock, 1970). Variables like book-to-market, earnings-to-price, firm size and leverage include a market value component.

One might expect these attributes to suffer from investor sentiment or mispricing. This may consequently cause randomness in results obtained by researchers over varied time periods. This is where the concept of SGR assumes importance in predicting expected stock returns as it does not contain any market value component. The relationship between firms' growth, shareholders' equity and retained earnings says that a company's growth rate is a function of the return that it makes on its shareholders' equity and the portion of its earnings that it ploughs back into that equity, provided that the firm has growth opportunities. Since growth opportunities are not directly observable, their proximate measure is profitability. Growth in shareholders' equity, over the long term, drives stock prices. It can then be presumed that SGR of firms shows the potential to deliver the kind of growth that will eventually contribute towards stock returns. A profitable business will experience a higher return on equity (ROE) as borrowings increase because a profitable firm is able to earn a rate of return higher than what it is paying for borrowed funds (Ward & Price, 2006). As my main test variable, I incorporate a single trait measure of firms' growth potential in the form of SGR calculated as depicted in equation (3) to examine its relationship with subsequent returns. [3]

In comparison to other benchmark determinants of stock returns, the SGR effect offers strong empirical manifestation. To determine the robustness of results, other measures of firm growth like asset growth (Cooper et al., 2008) and return on assets have been included in the regression model. Dynamic turnover of assets (Berk et al., 1999) was found to have a strong association with systematic risk and expected returns. The objective of firms to pick up the pace of growth and its impact on shareholder wealth requires attention. Since growth is not an instantaneous phenomenon, a study of growth and returns considered for the same year may not provide an adequate justification for the existence of this relationship. The present study incorporates a lead-lag relationship using ARDL model and tries to examine the linkage between growth measures and stock returns. As stock returns are volatile and non stationary, the degree of their stability also varies across time and cross sectional units. The present research seeks to overcome this challenge by pooling in data and using a panel data set within its analytical framework. Since, sustainable growth has the potential to positively affect a firm's stock returns; I hypothesize this relationship as follows:

***Hypothesis 2**: Sustainable growth has a positive impact on stock returns of the firm.*

As risk and return go hand in hand, it is imperative to examine the association between systematic risk and SGR. The phenomenon of risk has been widely studied across various dimensions in finance literature. Since, unsystematic risk can be reduced by diversifying the portfolio, the portion of risk that is of concern to investors is systematic risk. Considerable empirical research has examined the relationship between accounting variables and market based determinants of risk (beta). A number of empirical studies (e.g. Ball & Brown, 1969; Beaver, Kettler, & Scholes, 1970; Gonedes, 1973; Beaver & Manegold, 1975; Thompson, 1976; Myres & Turnbull, 1977 and Mandelker & Rhee, 1984) have examined the market-determined and accounting-determined explanations of risk. Hong & Sarkar (2007) examine beta as a function of firm characteristics, growth opportunities and macroeconomic variables. Higher betas of growth stocks with the market's discount-rate shocks and value stocks with the market's cash-flow shocks are determined by the cash-flow fundamentals of growth and value companies (Campbell et al., 2005). Chen & Zhang (1998) argued that value stocks were riskier because usually they were firms which were under financial distress, having high financial leverages and considerable uncertainty in their future earnings. Though not absolute, it is meaningful to categorize such firms in a class that has something in common - the likelihood to make a default. There is little doubt that systematic risk of a firm is pertinent in explaining the spread over and above the risk free rate of interest required by the lenders from the borrowers (Vassalou & Xing, 2004). Observed from this perspective, the issue of financing firm growth through an appropriate source of finance is an important aspect in the extensive literature that has tested the reasons of variations in market betas.

Durand (1957) appears to be the first author to bring to light the causal relationship between corporate growth variables and risk. This relationship was further explored by Bowman (1979) who challenged the existence of any significant relationship between systematic risk and growth of firm. The growth measures taken in his study were either growth as 'opportunities for investment in projects with an expected return higher than that of the existing firm', or growth as 'opportunities for investment in projects yielding excess return'. Hamada (1972) and Rubenstein (1973) classified systematic risk as operating risk and financial risk. Brenner & Schmidt (1978) further extended the study of Rubenstein (1973) to test the relationship between asset characteristics and systematic risk. The study by Hong & Sarkar (2007) used a meaningful proxy for growth (market-to-book ratio) to determine beta for firms. Koussis & Makrominas (2015) found that higher beta was associated with higher return volatility, lower book-to-market ratio, lower return on assets, higher operating and financial leverage and larger market capitalization (Size). Berk et al. (1999) provided evidence of systematic risk being explained by asset growth. They linked dynamic turnover of assets in place with lower levels of systematic risk and expected returns. Growth has been shown by several studies to have a clear impact on systematic risk of firms (Durand, 1957; Fewings, 1975; Hamid et al., 1994; Berk et al., 1999; Li et al., 2009;

Lockwood & Prombutr, 2010). The movement from growth options to assets in place reduces risk. A simple explanation to this is that an enhanced level of assets in place results in increased revenues of firms in the form of sales growth. At its different levels of growth, firm must feel different levels of shock of economic activities happening around. Various studies highlighted above provide evidence that growth results in reduced level of systematic risk. The manner in which growth may have an impact on the level of systematic risk seems to be straightforward.

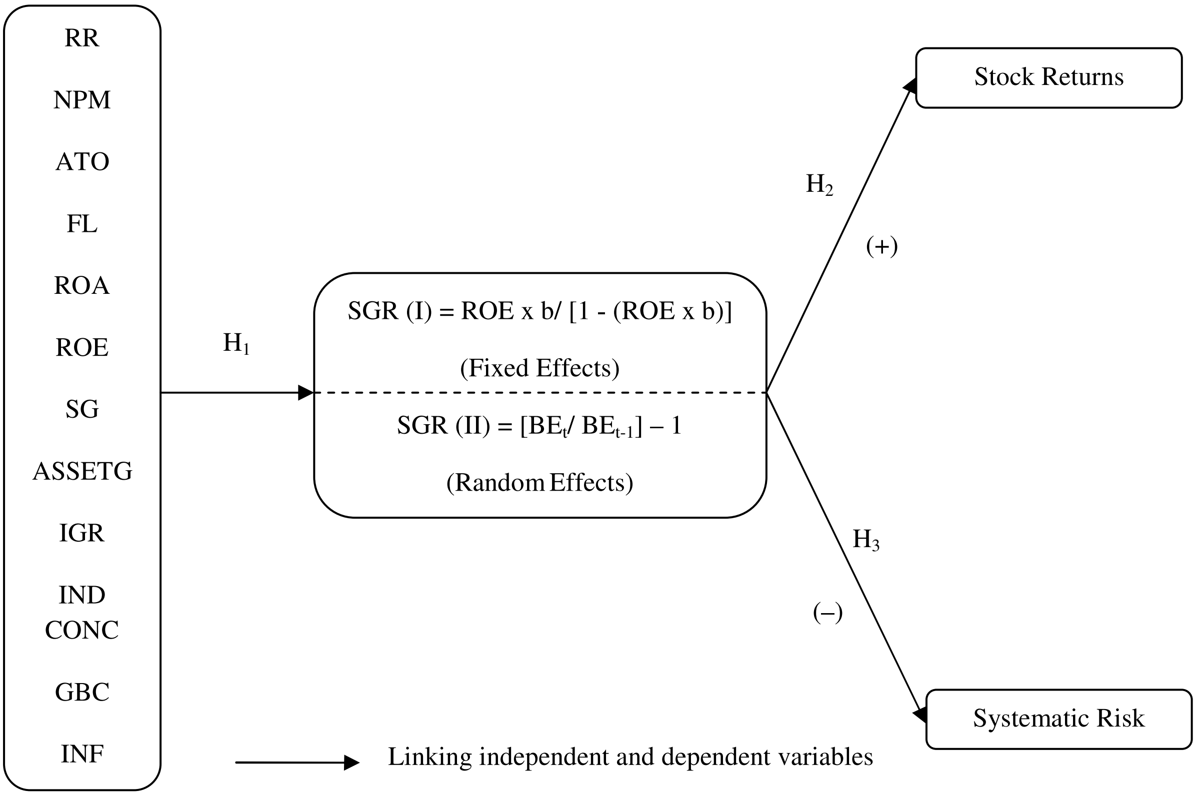
I use a future oriented parameter in the form of SGR along with the standard measures of growth to determine the impact of growth on systematic risk. I follow Graham & Dodd (1934) in my approach who introduced a benchmark for future earning capacity of firm. They highlighted PE ratio as a significant measure of future earning capacity of firm. Application of PE ratio is based on the idea that earnings have a relationship with firm value (Stefanis, 2005). Price-to-earnings is a relatively good indicator of predicting future earnings capacity of the firm (Ou & Penman, 1989). PE ratio has been reported as an important indicator of the rate of growth of earnings expected by the market (Pringle, 1973). Penman (1996) cited various interpretations of PE ratio like earnings growth indicator (Litzen-berger & Rao, 1971; Cragg & Malkiel, 1982), a risk measure (Ball, 1978) and earnings capitalization rate (Graham, Dodd, & Cottle, 1962; Boatsman & Baskin, 1981 and Alford, 1992) to name a few. However, PE ratio seems inadequate to understand that whether the projected growth rate of the company is realistic or not. In this case, sustainable growth would be helpful in determining how much growth a company could generate internally, given its level of profitability (Higgins, 1977). Lockwood & Prombutr (2010) attributed sustainable growth effect to risk and not to mispricing of assets. Their findings revealed that firms with higher level of SGR tend to have low default risk and lower book-to-market ratios, therefore, these firms command lower future returns (due to reduced level of risk). To provide meaningful experimental content, this study considers an alternative plausible model for assessing firm-specific betas based on different proxies of firm growth. While most of existing literature on systematic risk focuses on financial leverage effect, Jacquier et al. (2010) emphasized the importance of operating leverage along with financial leverage. While operating leverage determines the operational efficiency of the firm and financial leverage gives an indication of the utilization of funds, the one common measure that provides an indication of profitability, efficiency and asset utilization of the firm is SGR.

I attempt to examine the stochastic properties of systematic risk in relation to growth measures like SGR, asset growth rate and sales growth rate. Since market betas are volatile and non-stationary, their degree of stability should vary across cross sectional units as well as time. My research captures this heterogeneity using a panel vector autoregressive approach, thus examining the lead-lag relationship among growth variables and systematic risk. I test ability of growth to affect the level of risk of the firm by way of the following hypothesis:

Hypothesis 3*: Sustainable growth has an inverse impact on systematic risk of the firm.*

Based on the above discussion related to hypotheses formulated to achieve research objectives, a conceptual model is presented in figure 4.1.

Figure 4.1: Conceptual model: Determinants and impact of SGR on stock returns and systematic risk



(+) depicts hypothesized positive relationship; (–) depicts hypothesized inverse relationship

Source: Developed by author based on literature review.

In order to test the proposed hypotheses, an empirical test design has been presented in chapter 5. Chapter 5 provides a detailed description of the type and source of data used along with the sample size and the time period considered for the study. It also states the various regression models used to test the hypotheses discussed earlier.

CHAPTER 5

RESEARCH DESIGN

I incorporate a descriptive research design to examine the determinants of SGR. In order to highlight the association of SGR with stock returns and systematic risk, a causal research design has been used. Construction of variables and calibrated models used to examine these relationships has been discussed in this chapter.

5.1 Data selection and estimation of variables

This study employs regression analysis on a panel data set of 203 firms in the Indian manufacturing sector listed on the NSE during the period 1998 to 2014. CMIE's (Centre for Monitoring Indian Economy) database 'Prowess' has been used to extract information required to calculate internal (accounting) variables used in the study. Firms across nine industries have been considered. Details of firms are provided in Appendix. Manufacturing firms satisfying non missing value criteria for the period under examination have been considered part of the sample. Average sustainable growth (used to examine determinants of SGR) for selected firms in a given industry is the average SGR of firms calculated using formulas as shown in equations (3) and (4). Financial year closing values have been used to calculate the different ratios involved in the computation of SGR and other variables used in the study. Firms with only common equity have been selected (refer Lockwood & Prombutr, 2010). Firms with a negative value of book equity in any of the years of sample period have been omitted.

To analyze the impact of determinants of sustainable growth, external (industry level) variables used like industrial growth and inflation have been extracted from Open Government Data (OGD) Platform India while information on gross bank credit has been taken from the database of the Reserve Bank of India. Index of industrial production (IIP) has been used as a proxy of industrial growth for a particular industry. Inflation rate in various industries over the sample period has been estimated using the wholesale price index of selected industries.

Industry concentration has been assessed using Herfindahl-Hirschman Index (HHI) as shown below:

$$HHI_j = \sum_{i=1}^{I} S^2_{ij} \tag{5}$$

Where:

- S_{ij} is the market share of firm *i* in industry *j*. This calculation is performed for each year for each industry.

As an independent variable used along with SGR while investigating the impact of sustainable growth on stock returns, return on assets (ROA) equals net income divided by total assets. Measure related to growth in total assets of a firm as suggested by (Cooper et al., 2008) has been determined as given below:

$$\text{Asset Growth} = [\text{Total Assets}_t / \text{Total Assets}_{t-1}] - 1 \quad (6)$$

Sales growth has been calculated as year on year change in sales of firms as:

$$\text{Sales Growth} = [\text{Net Sales}_t / \text{Net Sales}_{t-1}] - 1 \quad (7)$$

Book-to-market equity (BE/ME) denotes the ratio of book value of equity to firms' market capitalization. Book value of equity (BE) has been calculated as book value of common equity plus the previous years' reserves and surpluses. Firm size (ME), referred to as SIZE in this study, is calculated as closing share price times the number of shares outstanding. [4] Use of natural log of firm size (market capitalization) has been made in order to make the data stationary. [5] Stock returns (ST RET) are the first difference of log of closing stock prices considered at financial year ending for the sample period (Fama & French, 1992; Lockwood & Prombutr, 2010).

As a common practice, systematic risk of asset is generally estimated by the market model in which the return of asset is regressed against market return and the regression coefficient beta thus offers an estimation of systematic risk (Berk et al., 1999; Li et al., 2009). In order to investigate the impact of sustainable growth on firm beta, this study estimates the level of systematic risk (β) as:

$$(\beta_{it}) = \text{Cov}(R_{it}, R_{mt}) / V(R_{mt}) \quad (8)$$

Where:

- R_{it} is return of stock of firm *i* at time *t* and R_{mt} is the market return for time *t;* and
- Cov and V are the covariance and variance representations respectively.

5.2 Regression models

Inclusion of financial data related to firms across different industries over a period of time brings in considerable heterogeneity in the units under consideration. The techniques of panel data estimation can take such heterogeneity explicitly into consideration by allowing for specific variables (refer Gujarati et al., 2013). This section of the thesis highlights the models depicting the determinants of SGR. SGR (I) values have been calculated using Angell's (2011) formula; where-as SGR (II) has been calculated taking year on year changes in the book equity (Babcock, 1970) of firms in selected industries. The firms need not fail if the actual reason of variation between sales growth and SGR is identified and corrected. In order to enhance the level of SGR of the firm, managers typically emphasize enhancing operational efficiency, controlling costs and reducing the payout ratios within a given set of macroeconomic conditions. Growth of a particular industry impacts firms operating within that industry. In general, the real rate of sustainable growth will be adversely affected by inflation (Johnson, 1981). There is a need to examine the determinants of SGR carefully. I develop my regression models in response to this need and examine internal (accounting) and external (macroeconomic) variables that affect SGR of firms. Only such variables that have been found significant individually in a bivariate regression analysis (see results in tables 6.1.1 and 6.1.2 of chapter 6) have been included in the multivariate regression models.

Model 1:

$$SGR\ (I)_{i,t} = \alpha_{0,t} + \alpha_{1,t}\ (NPM_{it}) + \alpha_{2,t}\ (ATO_{it}) + \alpha_{3,t}\ (ROA_{it}) + \alpha_{4,t}\ (ROE_{it}) + \alpha_{5,t}(SG_{it}) + \alpha_{6,t}\ (ASSETG_{it}) + \alpha_{7,t}\ (IGR_{it}) + \alpha_{8,t}\ (INF_{it}) + \mathcal{E}_{it} \quad (9)$$

Where, for year t:

- SGR (I) $_{i,t}$ is the SGR calculated using method I for industry i; and
- $\alpha_{i,t}$ are the slopes associated with various determinants of SGR.

For each year from 1998 to 2014, yearly average values of SGR (I) are regressed against its different determinants.

Model 2:

$$SGR\ (II)_{i,t} = \mu_{0,t} + \mu_{1,t}\ (NPM_{it}) + \mu_{2,t}\ (ATO_{it}) + \mu_{3,t}\ (ROA_{it}) + \mu_{4,t}\ (ROE_{it}) + \mu_{5,t}\ (SG_{it}) + \mu_{6,t}\ (ASSETG_{it}) + \mu_{7,t}\ (IGR_{it}) + \mu_{8,t}\ (INF_{it}) + \mathcal{E}_{it} \quad (10)$$

Where, for year t:

- SGR (II) $_{i,t}$ is the SGR calculated using method II for industry i; and
- $\mu_{i,t}$ are the slopes associated with various determinants of SGR.

For each year from 1998 to 2014, yearly average values of SGR (II) are regressed against its different determinants.

The magnitude and disproportion of variables used in the study result as an inadvertent source of heterogeneity in the data set. Application of panel data set takes into account such heterogeneity among the cross sectional units. To examine the possibility of a causal relationship between SGR and stock returns in presence of other strong contenders like book-to-market and firm size, the ARDL model takes the following form:

Model 3:

$$SR\ RET_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 ST\ RET_{t-p} + \sum_{i=1}^{p} \gamma_2 SGR_{t-p} + \sum_{i=1}^{p} \gamma_3 ASSETG_{t-p} + \sum_{i=1}^{p} \gamma_4 ROA_{t-p} + \sum_{i=1}^{p} \gamma_5 BE/ME_{t-p} + \sum_{i=1}^{p} \gamma_6 dlog\ (SIZE)_{t-p} + \mathcal{E}_t \quad (11)$$

In this equation:

- p denotes the lag length;
- γ_0 is the intercept; while
- $\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5$ and γ_6 denote the slopes associated with different lags of the exogenous variables.

Since the impact of SGR on stock returns is expected to be restrictive on the degree of firm size and its book-to-market ratio, hence, these variables have been introduced as a robustness check of the results of ARDL model used.

To examine the possibility of a causal relationship between beta (β) and growth related measures in the form of SGR, asset growth (ASSETG) and sales growth (SG), the ARDL model takes the following form:

Model 4:

$$\beta_t = \delta_0 + \sum_{i=1}^{p} \delta_1 BETA_{t-p} + \sum_{i=1}^{p} \delta_2 SGR_{t-p} + \sum_{i=1}^{p} \delta_3 ASSETG_{t-p} + \sum_{i=1}^{p} \delta_4 SG_{t-p} + \sum_{i=1}^{p} \delta_5 BE/ME_{t-p} + \sum_{i=1}^{p} \delta_6 dlog\ (SIZE)_{t-p} + \mathcal{E}_t \qquad (12)$$

In this equation:

- p denotes the lag length;
- δ_0 is the intercept; while
- δ_1, δ_2, δ_3, δ_4, δ_5 and δ_6 denote the slopes associated with different lags of exogenous variables.

Since the impact of growth measures on systematic risk is likely to be conditional on the size of the firm and its book-to-market ratio, this study uses a model that includes size and BE/ME ratio of firms.

As a preliminary examination, the means of selected variables for SGR portfolios have been reported in table 5.1. The possible number of portfolios is constrained by the number of firms under deliberation (Fieberg et al., 2016). For each portfolio and year, every variable is averaged for all stocks. Means are the time-series averages over the sample period. Results indicate that firms with higher levels of SGR tend to have higher asset growth rate and higher return on assets. Portfolios where sales growth exceeds SGR indicate a potential cash problem for the firms (refer figure 5.1).

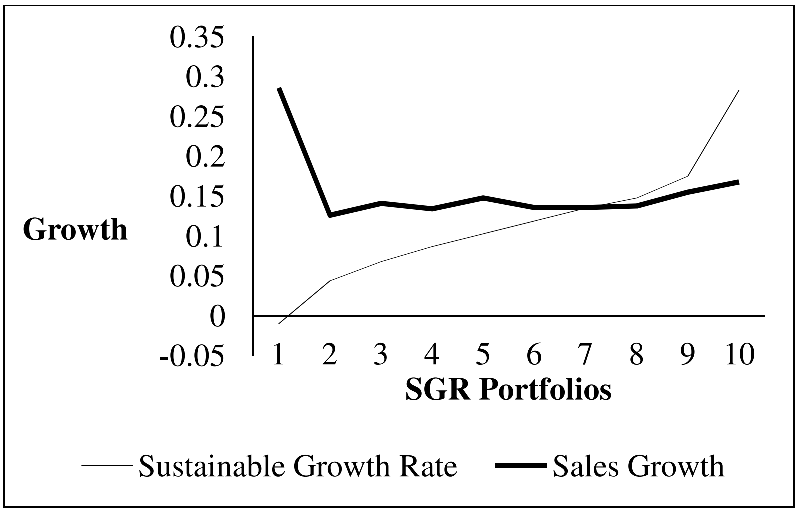
Table 5.1: Descriptive statistics: characteristics of SGR (I) & (II) decile portfolios

Panel A: Behaviour of proposed determinants (internal) of SGR (I)									
SGR Portfolio	SGR	RR (b)	NPM	ATO	FL	ROE	ROA	SG	ASSETG
Low	-0.010	0.821	0.005	0.823	3.219	-0.015	0.004	0.286	0.052
2	0.044	0.713	0.043	0.929	2.495	0.067	0.036	0.126	0.067
3	0.068	0.662	0.049	1.166	2.748	0.089	0.043	0.141	0.115
4	0.087	0.668	0.057	1.127	2.789	0.113	0.056	0.134	0.122
5	0.103	0.624	0.065	1.100	2.477	0.146	0.066	0.148	0.121
6	0.119	0.619	0.085	1.149	2.363	0.157	0.075	0.136	0.120
7	0.135	0.633	0.072	1.384	2.323	0.194	0.090	0.136	0.122
8	0.148	0.624	0.080	1.455	2.262	0.181	0.095	0.138	0.145
9	0.175	0.709	0.092	1.154	2.429	0.201	0.100	0.155	0.163
High	0.283	0.672	0.124	1.414	4.188	-0.025	0.120	0.168	0.204

Panel B: Behaviour of proposed determinants (internal) of SGR (II)									
SGR Portfolio	SGR	RR (b)	NPM	ATO	FL	ROE	ROA	SG	ASSETG
Low	0.006	0.781	0.013	0.920	2.292	0.030	0.014	0.093	0.044
2	0.053	0.690	0.045	1.155	2.650	0.103	0.044	0.109	0.069
3	0.081	0.628	0.050	1.158	2.879	0.108	0.055	0.324	0.098
4	0.098	0.615	0.080	0.961	2.289	0.157	0.071	0.104	0.087
5	0.117	0.626	0.059	1.170	3.015	0.137	0.064	0.149	0.111
6	0.131	0.651	0.081	1.205	2.470	0.138	0.084	0.143	0.128
7	0.145	0.655	0.064	1.607	2.458	0.171	0.085	0.141	0.131
8	0.165	0.740	0.078	1.126	2.603	0.170	0.082	0.142	0.151
9	0.191	0.646	0.091	1.220	2.156	0.191	0.099	0.167	0.180
High	0.338	0.730	0.109	1.142	4.471	-0.099	0.085	0.201	0.239

SGR is the sustainable growth rate. RR(b) refers to the profit retention ratio calculated as retained profits divided by net income, NPM is the net profit margin calculated as net income divided by sales, ATO is asset turnover calculated as sales divided by total assets and FL is financial leverage calculated as total assets divided by book value of equity. ROE denotes return on equity calculated as a product of NPM, ATO and FL. ROA is return on assets calculated as net income divided by total assets. SG and ASSETG refer to sales growth and asset growth calculated as year on year growth in these variables respectively. All ratios have been calculated using financial year closing values.

Figure 5.1: Comparison of SGR and sales growth for SGR decile portfolios



Source: Depiction based on figures arrived at on the basis of author's calculations. This figure depicts the comparison of SGR (I) and sales growth of the firms. Similar results have been arrived at when comparing SGR (II) and sales growth of the firms (though not depicted in this report).

Chapter 6 highlights empirical results of the various regression models used in the study. Results related to the hypotheses tested (formulated in chapter 4) have been reported.

CHAPTER 6

EMPIRICAL RESULTS

The first step of my empirical analysis examines the determinants of SGR (calculated using two different methods). I do this using panel data regression analysis and assess what a change in method of calculating SGR can capture. Consistent with expectations, a comparison of SGR (calculated using two different methods) of firms in the Indian manufacturing sector shows a high degree of correlation as depicted in table 6.1.

Table 6.1: Correlation matrix for SGRs calculated using two different methods

Correlations		
	SGR (I)	SGR (II)
SGR (I)	1	
SGR (II)	0.898	1

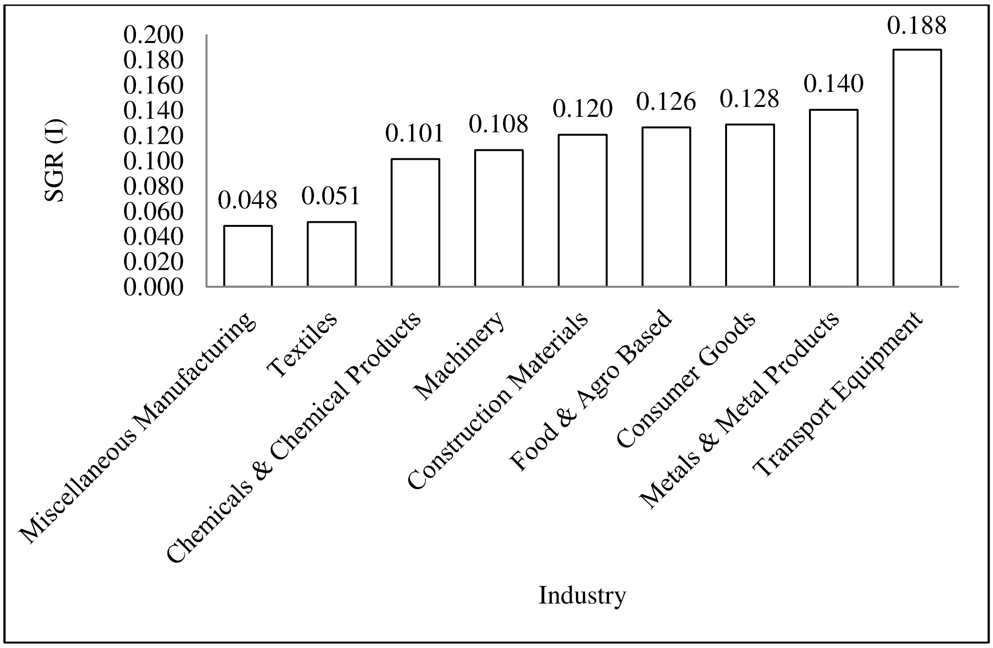
Table 6.2: Arrangement of industries in increasing order of SGR (I) [6]

Industry	Mean	SD	Minimum	Maximum
Miscellaneous Manufacturing	0.048	0.060	-0.123	0.124
Textiles	0.051	0.048	-0.027	0.121
Chemicals & Chemical Products	0.101	0.024	0.064	0.146
Machinery	0.108	0.046	0.060	0.204
Construction Materials	0.120	0.074	0.009	0.276
Food & Agro Based	0.126	0.039	0.074	0.195
Consumer Goods	0.128	0.118	-0.035	0.402
Metals & Metal Products	0.140	0.074	0.046	0.288
Transport Equipment	0.188	0.209	0.061	0.962

SD is the standard deviation of average SGR (I) of the selected industries.

In an arrangement of industries in ascending order of SGR (I) in table 6.2 and figure 6.1, transport equipment industry has been found to have the highest average SGR (18.8 per cent) followed by metals and metal products (14.0 per cent) and the consumer goods industry (12.8 per cent). Textile industry and miscellaneous manufacturing firms in the manufacturing industry show minimum levels of SGR (5.1 per cent and 4.8 per cent respectively).

Figure 6.1: SGR (I) for selected industries



Source: Depiction based on author's calculations.

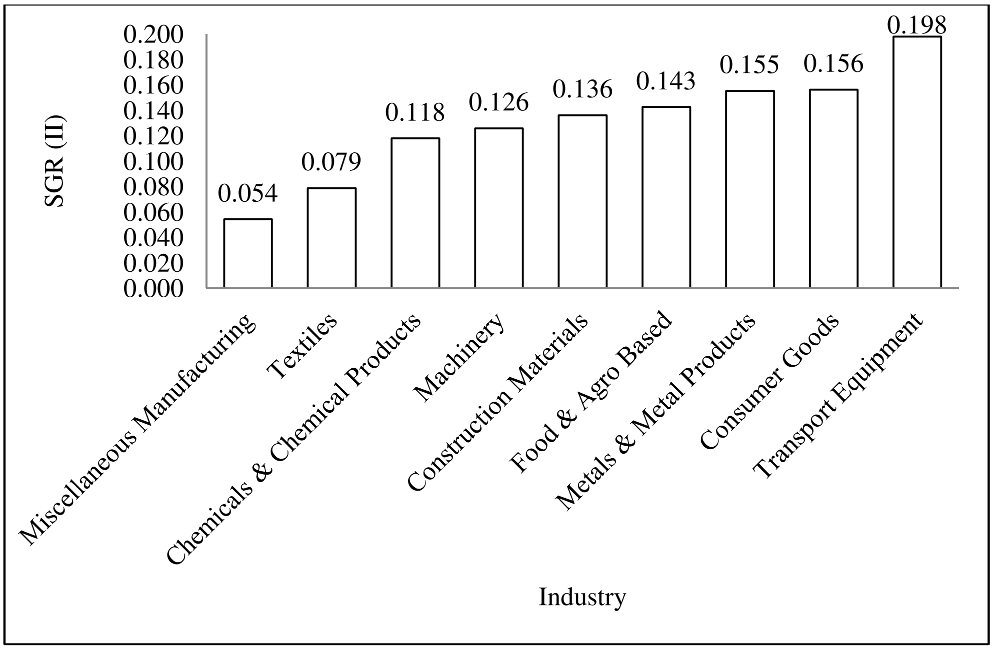
These results are in concurrence with the results obtained by calculating the average SGR of industries by the second method (SGR II) in table 6.3 and figure 6.2. Transport industry has been found to have highest level of SGR (II) with 19.8 per cent followed by the consumer goods industry and metals and metal products with SGRs of 15.6 per cent and 15.5 per cent respectively.

Table 6.3: Arrangement of industries in increasing order of SGR (II)

Industry	Mean	SD	Minimum	Maximum
Miscellaneous Manufacturing	0.054	0.090	-0.112	0.194
Textiles	0.079	0.100	-0.020	0.385
Chemicals & Chemical Products	0.118	0.039	0.062	0.175
Machinery	0.126	0.070	0.050	0.269
Construction Materials	0.136	0.096	0.001	0.307
Food & Agro Based	0.143	0.068	0.018	0.261
Metals & Metal Products	0.155	0.095	-0.038	0.327
Consumer Goods	0.156	0.137	-0.022	0.533
Transport Equipment	0.198	0.234	-0.044	1.046

SD is the standard deviation of average SGR (II) of the selected industries.

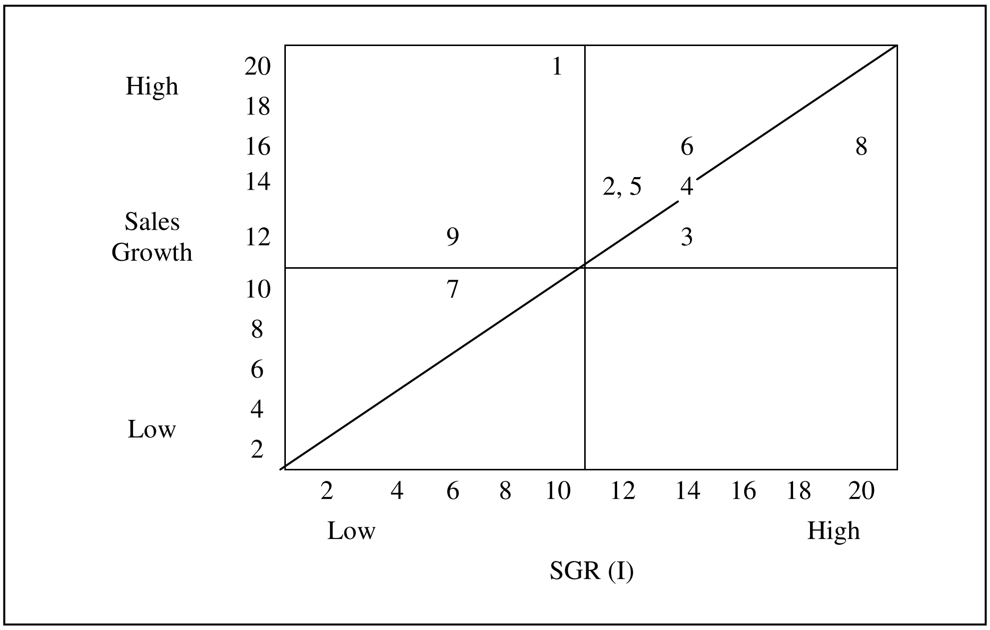
Figure 6.2: SGR (II) for selected industries



Source: Depiction based on author's calculations.

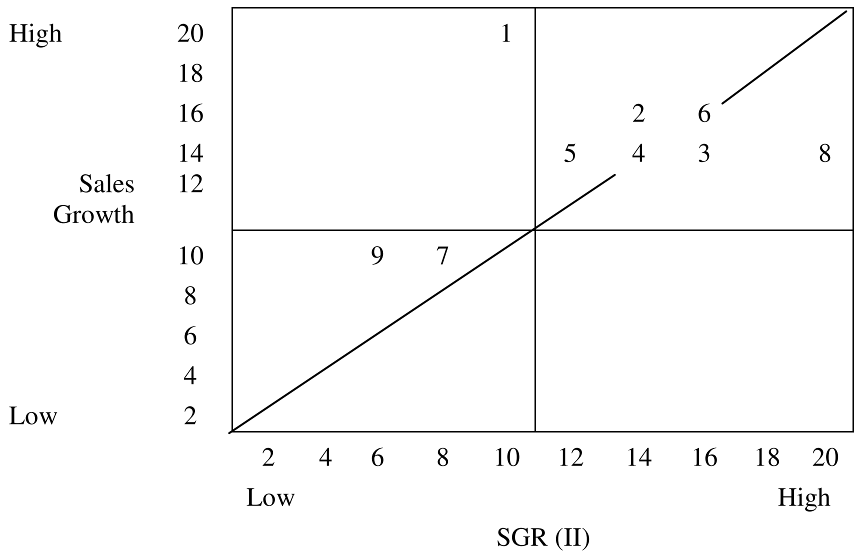
To appreciate the importance of SGR in identifying the frontrunner industries, I illustrate a comparison of SGRs (I) and (II) with industry growth rates (calculated in terms of average sales growth of firms in these industries) in figures 6.3 and 6.4.

Figure 6.3: SGR (I) and sales growth for selected industries



Source: Illustration based on author's calculations of SGR (I) and sales growth rate. Consistent with Jarvis et al. (1992), I consider growth rates exceeding 10 per cent to be high for the purpose of comparison.

Figure 6.4: SGR (II) and sales growth for selected industries



Industry Number	Name of the Industry
1	Chemicals & Chemical Products
2	Construction Materials
3	Consumer Goods
4	Food & Agro Based
5	Machinery
6	Metals & Metal Products
7	Textiles
8	Transport Equipment
9	Miscellaneous Manufacturing

Source: Illustration based on author's calculations of SGR (II) and sales growth rate. Consistent with Jarvis et al. (1992), I consider growth rates exceeding 10 per cent to be high for the purpose of comparison.

The patterns in figure 6.3 and figure 6.4 are largely consistent. Industries like chemicals and chemical products, construction materials and miscellaneous manufacturing give an alarming indication. This is because the results for these industries demonstrate an imbalance between the actual average growth rates in sales and their average SGRs. Among the steps that firms in these industries can take to maintain a balance are issuance of new shares, reduction in dividend payout, increased debt funding and an improvement in operating performance. However, most firms will not prefer to issue new equity capital as a remedy to this cash flow problem. In under developed countries as well as those without fully developed equity markets, this cannot even be thought of as an option. [7]

Evidently, SGR emerges as an important screening tool for evaluating firms. It shows the potential of firms that can uphold in highly competitive markets but do not have, for one reason or another, the capacity to issue new equity (Jarvis et al., 1992). For firms with lower levels of SGR as compared to their average sales growth rates, there can be multiple structural reasons. Thus, I propose a closer look on the conditioning variables. A firm may be fundamentally stronger yet have a low level of SGR. Firms operating in capital intensive industries like machinery and construction materials have lower asset turnover ratios, resulting in a lower SGR. Of particular interest becomes the fundamental behaviour of the financial ratios used to calculate SGR. A strong motivation to examine the determinants of SGR also arises from the question - does there exists any significant difference in financial ratios of firms across industries?

Objective 1: To examine the approaches of calculating sustainable growth and analyzing the impact of its determinants.

6.1.1 Bivariate regression analysis

I examine the determinants of SGR (I and II) in this segment using panel data regression analysis. My analysis is based on the results of the F-test and incremental F-test for fixed effect regression model and Hausman test for random effect regression model as shown in table 6.1.1 and table 6.1.2. The fixed effect panel regression model is applied in order to study the impact of selected determinants considering significant heterogeneity among industries. Random effect panel regression model can be applied in case the effects of the determinants are random. The rationale is that industries differ on the basis of micro and macro factors which causes different determinants to have different impact on SGRs. Table 6.1.1 and 6.1.2 highlight the results of the F-test (for applicability of fixed effect model) and Hausman test (for applicability of random effect model).

The impact of the various determinants on SGR of firms in select industries is discussed in succeeding segments of this study. Profit retention ratio and financial leverage do not seem to impact SGR as per initial findings. This differs from the results of Higgins (1977) which state that profit retention affects SGR.

Table 6.1.1: Selection of variables as determinants of SGR (I)

Variable	Pooled		Cross Section Fixed Effect		Cross Section Random Effect	
	F-test	P-value	F-statistic	P-value	Hausman Test	P-value
Profit Retention Ratio	1.426	0.234	-	-	-	-
Net Profit Margin	214.371	0.000*	10.019	0.000*	2.252	0.133
Asset Turnover	15.188	0.000*	1.542	0.149	0.286	0.593
Financial Leverage	3.354	0.069	-	-	-	-
Return on Assets	87.501	0.000*	4.596	0.000*	7.318	0.007*
Return on Equity	12.410	0.001*	3.636	0.001*	0.002	0.968
Sales Growth	6.182	0.014**	3.285	0.002*	0.635	0.425
Asset Growth	108.067	0.000*	1.328	0.235	6.359	0.012**
Industrial Growth	30.428	0.000*	3.342	0.002*	0.264	0.607
Industry Concentration	0.609	0.436	-	-	-	-
Gross Bank Credit	3.343	0.070	-	-	-	-
Inflation	21.041	0.000*	4.312	0.000*	1.020	0.313

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance.

Table 6.1.2: Selection of variables as determinants of SGR (II)

Variable	Pooled		Cross Section Fixed Effect		Cross Section Random Effect	
	F-test	P-value	F-statistic	P-value	Hausman Test	P-value
Profit Retention Ratio	0.795	0.374	-	-	-	-
Net Profit Margin	169.170	0.000*	4.854	0.000*	3.542	0.060
Asset Turnover	9.557	0.002*	1.024	0.421	0.180	0.672
Financial Leverage	0.899	0.345	-	-	-	-
Return on Assets	67.560	0.000*	2.592	0.012**	9.356	0.002*
Return on Equity	5.223	0.024**	2.265	0.027**	0.055	0.815
Sales Growth	7.572	0.007*	2.076	0.042**	0.391	0.532
Asset Growth	155.624	0.000*	0.683	0.706	0.709	0.400
Industrial Growth	31.374	0.000*	2.769	0.007*	1.690	0.194
Industry Concentration	0.927	0.337	-	-	-	-
Gross Bank Credit	1.671	0.198	-	-	-	-
Inflation	16.890	0.000*	2.805	0.007*	1.485	0.223

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance.

Similarly, my initial tests do not support a significant impact of industry concentration and gross bank credit extended to a particular industry on SGR of firms in that industry. Further, the impact of individual determinants of SGR was found significant as shown in tables 6.1.1 and 6.1.2; results of bivariate pooled regression models have been presented in table 6.1.3.

Table 6.1.3: Results of bivariate regressions of various determinants of SGR

Regression Specification: SGR (I)					Regression Specification: SGR (II)				
	Slope	t-stat	R^2	F		Slope	t-stat	R^2	F
NPM	2.825	17.701 (0.000) *	0.686	310.586 (0.000) *	NPM	3.174	14.209 (0.000) *	0.583	198.353 (0.000) *
ATO	0.119	3.043 (0.003) *	0.062	9.306 (0.003) *	ATO	0.119	2.896 (0.004) *	0.056	8.437 (0.004) *
ROA	3.096	9.765 (0.000) *	0.514	15.777 (0.000) *	ROA	3.455	8.258 (0.000) *	0.413	10.484 (0.000) *
ROE	0.075	3.686 (0.000) *	0.088	13.679 (0.000) *	ROE	0.061	2.372 (0.019) **	0.038	5.663 (0.019) **
SG	0.139	2.355 (0.020) **	0.038	5.559 (0.020) **	SG	0.193	2.675 (0.008) *	0.048	7.184 (0.008) *
ASSETG	0.863	10.396 (0.000) *	0.432	108.067 (0.000) *	ASSETG	1.139	12.363 (0.000) *	0.523	155.624 (0.000) *
IGR	0.001	5.460 (0.000) *	0.174	29.971 (0.000) *	IGR	0.001	5.861 (0.000) *	0.194	34.187 (0.000) *
INF	0.001	5.110 (0.000) *	0.155	26.110 (0.000) *	INF	0.001	4.453 (0.000) *	0.122	19.764 (0.000) *

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. NPM is the net profit margin calculated as net income divided by sales, ATO is asset turnover ratio calculated as sales divided by total assets, ROA is return on assets calculated as net income divided by total assets and ROE is return on equity calculated as net income divided by book value of equity. SG and ASSETG refer to sales growth and asset growth respectively calculated as year on year percentage change in these variables. IGR is the industry growth rate estimated from the index of industrial production and INF is inflation rate estimated from wholesale price index for various years for different industries.

All determinants of SGR which were found significant in the initial pooled bivariate regression test depict consistency in explaining variations in SGR (I) and SGR (II). However, the combined impact of these estimators needs to be considered. I next examine the combined impact of various factors affecting the level of SGR.

6.1.2 Multivariate regression analysis

I examine the determinants of SGR using multivariate regression analysis (refer **model 1** and **model 2** in chapter 5). The actual reason behind the variation between sales growth and SGR needs to be identified and corrected. In order to enhance the level of SGR of the firm, managers typically lay emphasis on enhancing operational efficiency, cutting costs and reducing payout ratios within a given set of macroeconomic conditions. Growth of a particular industry impacts firms operating within that industry. In general, the real rate of sustainable growth will be adversely affected by inflation (Johnson, 1981). These measures collectively contribute towards the variations in SGR. Thus, it is important to recognize this impact so that remedial action can be taken well in time to avoid disparity of financial goals and policies. Table 6.1.4 reports pair wise correlations among the variables considered in the study. Only those variables that have been found significant individually have been included in the regression models.

Table 6.1.6 depicts the t-statistics and P-value (reported beneath t-statistics) for **models 1** and **2** computed using a pooled data set of firms for a period of 17 years. Asset growth, net profit margin and return on equity emerge as significant internal determinants of SGR. Conversely, no momentous relationship between asset turnover, return on assets and sales growth has been substantiated. Among the external variables, only industrial growth seems to dictate SGR. However, the pooled regression models ignore the two essential aspects pertinent in panel data framework. First, they ignore the individual (space) dimension, i.e. the factors that are particular to each cross sectional unit but remain unaffected over time. Second, these models do not consider the time dimension which may include factors specific to the period in which they take place but are not carried across time periods for selected cross sectional units. Thus, these models (pooled regression models) neither distinguish between industries, nor do they talk about the behaviour of SGR over the sample period. Therefore, it is important to incorporate an appropriate model to examine the determinants of SGR. I discuss this in subsequent sections of this study.

Table 6.1.4: Correlation matrix of determinants of SGR (I) and (II)

Correlation Probability	SGR (I)	SGR (II)	ASSETG	ATO	NPM	ROA	ROE	SG	IGR	INF
SGR (I)	1.000									
SGR (II)	0.898 (0.000) *	1.000								
ASSETG	0.657 (0.000) *	0.723 (0.000) *	1.000							
ATO	0.311 (0.000) *	0.251 (0.002) *	0.280 (0.001) *	1.000						
NPM	0.776 (0.000) *	0.737 (0.000) *	0.653 (0.000) *	0.079 (0.349)	1.000					
ROA	0.617 (0.000) *	0.568 (0.000) *	0.550 (0.000) *	0.435 (0.000) *	0.751 (0.000) *	1.000				
ROE	0.283 (0.000) *	0.188 (0.024) **	0.155 (0.064)	0.039 (0.647)	0.170 (0.041) **	0.195 (0.019) **	1.000			
SG	0.204 (0.014) **	0.225 (0.007) *	0.373 (0.000) *	0.172 (0.039) **	0.266 (0.001) *	0.250 (0.003) *	0.115 (0.171)	1.000		
IGR	0.420 (0.000) *	0.425 (0.000) *	0.407 (0.000) *	0.228 (0.006) *	0.312 (0.000) *	0.304 (0.000) *	0.088 (0.292)	0.161 (0.054)	1.000	
INF	0.359 (0.000) *	0.326 (0.000) *	0.375 (0.000) *	0.104 (0.213)	0.500 (0.000) *	0.530 (0.000) *	0.115 (0.171)	0.176 (0.035) **	0.193 (0.020) **	1.000

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. Refer foot note in table 6.1.3 for abbreviations and details related to calculation of variables mentioned in the above table.

To assess the suitability of regression model applicable to analyze the determinants of SGR, I apply fixed effect F-test and Hausman test. The results of F-test and Hausman test for deciding the applicability of the type of model to be used to examine the determinants of SGR are highlighted in table 6.1.5.

Table 6.1.5: Applicability of model for analyzing various determinants of SGR

Dependent Variable	Fixed Effects Model		Random Effects Model	
	F-test	P value	Hausman Test	P value
Sustainable Growth Rate (I)	2.692	0.009*	21.535	0.006*
Sustainable Growth Rate (II)	1.340	0.230	10.723	0.218

*Values are significant at 1 per cent level of significance.

I propose fixed effect model for analyzing the determinants of SGR (I) and random effect model for analyzing the determinants of SGR (II). The P value of fixed effect F-test (0.009) indicates the applicability of fixed effect model to analyze the determinants of SGR (I) (refer **model 1**). P value of 0.218 points towards the acceptance of null hypothesis of Hausman test which states that effects across industries are random, thus indicating the applicability of random effect model to examine the determinants of SGR (II). The results also suggest that any individual or unobserved effect (effect specific to cross sectional unit) is uncorrelated with other regressors used in **model 2**. These results make sense as a given percentage change in book value of equity will not inform of profitability, efficiency and leverage of firms. Nor will it capture any information on substantial changes in the macroeconomic environment. Book value of equity is increasingly being reported as a negative number; such negative number has no obvious interpretation as it opposes the limited liability structure of firms which proposes that shareholders' value cannot be negative (Brown et al., 2008). This result is also in line with those of Collins et al. (1999) that do not support the role of book value of equity as a control for scale differences.

The individual components of SGR which were found significant (refer table 6.1.3) suggest an array of possible diagnostic directions that managers could follow. Using **models 1** and **2** with an appropriate panel data regression technique (as depicted in table 6.1.5), table 6.1.6 demonstrates the empirical results of fixed effect and random effect panel data models highlighting the determinants of SGR calculated using both methods.

I regress SGR (I) against its various determinants using a fixed effect panel data regression model. I document an increase in the explanatory power (R^2) of the model from 73.4 per cent (using pooled regression model) to 77.3 per cent (using fixed effect model). Most of the variation in SGR however, seems to have been affected by net profit margin and return on equity. P value of net profit margin and return on equity is found to be less than 1 per cent level of significance, representing a significant impact of these variables on sustainable growth calculated using method I.

Table 6.1.6: Impact of determinants of SGR using multivariate regression models

			SGR (I)		SGR (II)	
Variable	Expected Sign of t statistic		Pooled Model	Fixed Effect Model	Pooled Model	Random Effect Model
		R^2	0.734	0.773	0.686	0.686
INTERCEPT	?		-4.872	-1.124	-2.812	-2.840
			(0.000) *	(0.263)	(0.006) *	(0.005) *
ASSETG	+		2.328	1.633	5.050	5.101
			(0.021) **	(0.105)	(0.000) *	(0.000) *
ATO	+		4.868	0.404	2.525	2.550
			(0.000) *	(0.687)	(0.013) **	(0.012) **
NPM	+		9.113	9.530	6.509	6.574
			(0.000) *	(0.000) *	(0.000) *	(0.000) *
ROA	+		-2.348	-1.513	-1.588	-1.604
			(0.020) **	(0.133)	(0.115)	(0.111)
ROE	+		3.493	3.086	1.168	1.180
			(0.001) *	(0.003) *	(0.245)	(0.240)
SG	+		-1.858	-0.594	-1.424	-1.438
			(0.065)	(0.554)	(0.157)	(0.153)
IGR	+		2.410	0.618	2.219	2.241
			(0.017) **	(0.538)	(0.028) **	(0.027) **
INF	-		-0.701	-0.061	-1.147	-1.159
			(0.485)	(0.952)	(0.253)	(0.249)

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. This table depicts the t-statistics and their corresponding (P values) for various determinants of SGRs calculated using methods (I) and (II). Refer foot note in table 6.1.3 for abbreviations and details related to calculation of variables mentioned in the above table.

Return on assets and asset growth, which seemed to significantly impact SGR in the initial pooled regression model, lose their importance. These results support the assertion of

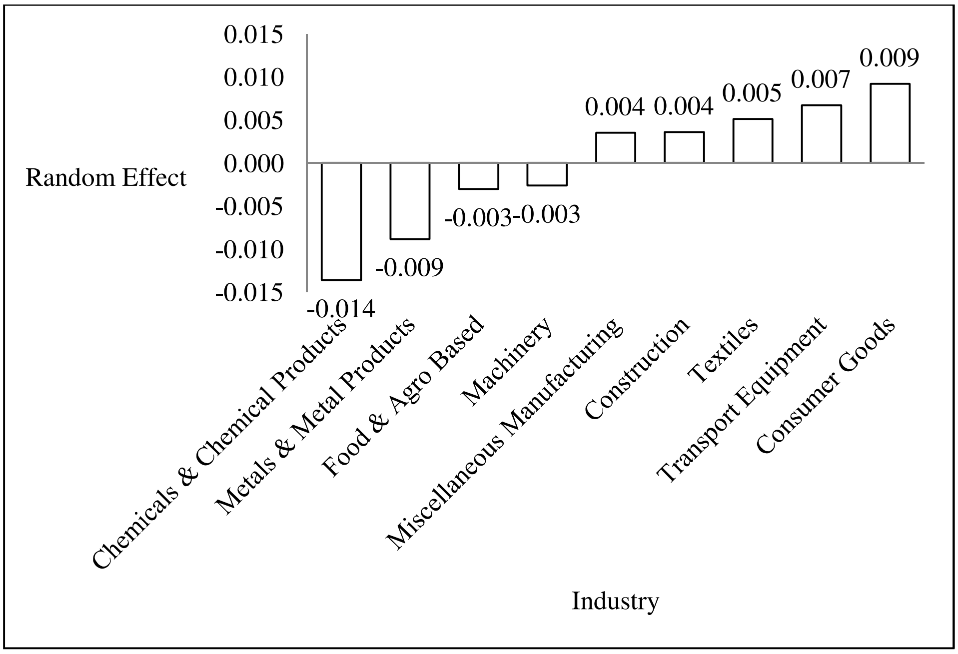
Lockwood & Prombutr (2010) that high sustainable growth firms tend to have low default risk. They attributed this to the ability of high net profit margins turning as a source of internal financing. Thus, firms have to rely less on debt and new equity. Net profit margin and return on equity seem to subsume industrial growth impact. Inflation effect appears to be redundant in explaining the variations in SGR. This is in line with Higgins (1981) who contends that inflation has no real impact on the real SGR. The likelihood of the impact of external variables like industrial growth and inflation has been ruled out. Consequently, it is of value to consider the results of random effects model. The P values of asset growth and net profit margin are found to be less than 1 per cent level of significance whereas the P values of turnover of assets and industrial growth are found to be less than 5 per cent level of significance. However, no considerable variation in R^2 is found (remains 68.6 per cent in both cases).

The results which considerably vary from expectations have been illustrated. Any change in the variables listed in table 6.1.6 is expected to bring a proportionate change in SGR in the same direction (except inflation which is expected to drag SGR in a downward direction). Yet, return on assets, sales growth and inflation lose their explanatory power when studied as a combination with other determinants of sustainable growth. I attribute this to various reasons. First, higher return on assets is a sign of better management of assets. However, too high a return on assets indicates insufficient or undercapitalization in assets. A mismatch between return on assets and SGR can be a potential cause of concern for firms. But the application of return on assets in models explaining sustainable growth of firms makes sense if applied for comparison of firms in industries having the same level of capitalization. Second, an insignificant relationship between sales growth and SGR can be attributed to other factors affecting SGR. A firm may witness an increased sale but may not be efficient enough to cut its costs. Net profit margin, which is expected to fuel the sustainable growth of the firms, seems to fulfil its desired role (t-statistic of 9.113, 9.530, 6.509 and 6.574 in different models with $p < 0.01$). This in turn, enhances the return on equity for the firms.

Moving away from the institutional perspective towards the sociological perspective, industrial growth seems to impact SGR. Results of random effect model illustrate that in addition to firms' competencies, SGR is determined by external characteristics like industrial growth. As per the characteristics of random effects model which imply that difference between firms rests in the variance of error term, figure 6.1.1 highlights the random effects of selected industries. It is evident that SGR calculated using ROE and profit retention ratio (Angell, 2011) produces an objective screening procedure as compared to variations in book value of equity (Babcock, 1970) as it considers the apparent heterogeneity among various industrial groups. The second method of calculating SGR suffers from a serious inadequacy as it falls short of capturing firm and industry specific disparity among units under consideration.

Sustainable growth can be said to vary because of many reasons. However, financial performance of a firm will find a place among major factors affecting sustainable growth. Tables 6.1.7 and 6.1.8 highlight the potential endogeneity problem (if any) in regression **model 1** and **model 2**. As can be seen, error term is not significantly correlated with any of the independent variables, hence, the problem of endogeneity can be ruled out, thus leaving behind a negligible possibility of an unobserved financial variable that may determine SGR.

Figure 6.1.1: Random effects of selected industries



Source: Illustration based on author's calculation of random effects of selected industries.

Pair wise correlations of the error term with independent variables are highlighted in table 6.1.7 and table 6.1.8.

Table 6.1.7: Testing of endogeneity for determinants of SGR (I)

Correlation Probability	SGR (I)	ASSETG	ATO	NPM	ROA	ROE	SG	IGR	INF	RESID
SGR (I)	1.000									
ASSETG	0.657 (0.000) *	1.000								
ATO	0.311 (0.000) *	0.280 (0.001) *	1.000							
NPM	0.776 (0.000) *	0.653 (0.000) *	0.079 (0.349)	1.000						
ROA	0.617 (0.000) *	0.550 (0.000) *	0.435 (0.000) *	0.751 (0.000) *	1.000					
ROE	0.283 (0.001) *	0.155 (0.064)	0.039 (0.647)	0.170 (0.041) **	0.195 (0.019) **	1.000				
SG	0.204 (0.014) **	0.373 (0.000) *	0.172 (0.039) **	0.266 (0.001) *	0.250 (0.003) *	0.115 (0.171)	1.000			
IGR	0.420 (0.000) *	0.407 (0.000) *	0.228 (0.006) *	0.312 (0.000) *	0.304 (0.000) *	0.088 (0.292)	0.161 (0.054)	1.000		
INF	0.359 (0.000) *	0.375 (0.000) *	0.104 (0.213)	0.500 (0.000) *	0.530 (0.000) *	0.115 (0.171)	0.176 (0.035) **	0.193 (0.020) **	1.000	
RESID	0.477 (0.000) *	-1.11E-15 (1.000)	5.16E-16 (1.000)	-1.42E-15 (1.000)	-2.51E-15 (1.000)	-3.34E-16 (1.000)	-2.25E-16 (1.000)	6.85E-16 (1.000)	-2.05E-15 (1.000)	1.000

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. Refer foot note in table 6.1.3 for abbreviations and details related to calculation of variables mentioned in the above table. RESID depicts the error term of fixed effects regression model (**model 1**) used to examine the determinants of SGR (I).

Table 6.1.8: Testing of endogeneity for determinants of SGR (II)

Correlation Probability	SGR (II)	ASSETG	ATO	NPM	ROA	ROE	SG	IGR	INF	RESID
SGR (II)	1.000									
ASSETG	0.723 (0.000) *	1.000								
ATO	0.251 (0.002) *	0.280 (0.001) *	1.000							
NPM	0.737 (0.000) *	0.653 (0.000) *	0.079 (0.349)	1.000						
ROA	0.568 (0.000) *	0.550 (0.000) *	0.435 (0.000) *	0.751 (0.000) *	1.000					
ROE	0.188 (0.024) **	0.155 (0.064)	0.039 (0.647)	0.170 (0.041) **	0.195 (0.019) **	1.000				
SG	0.225 (0.007) *	0.373 (0.000) *	0.172 (0.039) **	0.266 (0.001) *	0.250 (0.003) *	0.115 (0.171)	1.000			
IGR	0.425 (0.000) *	0.407 (0.000) *	0.228 (0.006) *	0.312 (0.000) *	0.304 (0.000) *	0.088 (0.292)	0.161 (0.054)	1.000		
INF	0.326 (0.000) *	0.375 (0.000) *	0.104 (0.213)	0.500 (0.000) *	0.530 (0.000) *	0.115 (0.171)	0.176 (0.035) **	0.193 (0.020) **	1.000	
RESID	0.546 (0.000) *	-0.010 (0.904)	0.014 (0.871)	-0.023 (0.782)	-0.003 (0.971)	-0.015 (0.862)	-0.018 (0.829)	0.002 (0.979)	-0.015 (0.860)	1.000

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. Refer foot note in table 6.1.3 for abbreviations and details related to calculation of variables mentioned in the above table. RESID depicts the error term of random effects regression model (**model 2**) used to examine the determinants of SGR (II).

Theory corroborates that the formulas used in equations (3) and (4) of chapter 4 are conceptually same. However, my work offers a logical justification to comment on a suitable method of calculating SGR. I assert that SGR calculated using ROE and profit retention ratio (equation 3) is useful in explaining the aspects specific to a cross sectional unit. On the contrary, the same does not hold true for SGR calculated using change in book equity, as it does not capture factors specific to cross sectional units. The results obtained by using fixed and random effects models support this argument. Thus, hypothesis 1 formulated in chapter 4 of this report is accepted. Using random effects model, I propose that variations in SGR are random across firms in different industries. Thus, statistical inferences are conditional as they do not capture the impact of industry specific factors. However, random effects model estimators do not seem to be biased as none of the independent variables are significantly correlated with the error term.

Objective 2: To investigate the impact of sustainable growth on stock returns of the firm.

Initially, the results of SGR decile portfolios have been reported in table 6.4. Means of selected characteristics of SGR portfolios are reported. For each portfolio and year, each variable is averaged for all stocks. Means are the time-series averages over the sample period. Results indicate that firms with higher levels of SGR tend to have higher asset growth rates, higher return on assets but lower book-to-market ratio. My results are in accord to those of Lockwood & Prombutr (2010).

Table 6.4: Descriptive statistics: characteristics of sustainable growth portfolios

SGR Decile Portfolios	SGR	SG	ASSETG	ROA	BE/ME	SIZE (Rs. Millions)
Low	-0.010	0.298	0.053	0.004	3.039	12405.371
2	0.044	0.114	0.066	0.036	2.445	2969.409
3	0.068	0.141	0.115	0.043	1.285	28207.483
4	0.087	0.134	0.122	0.056	1.652	10472.969
5	0.103	0.148	0.121	0.066	1.369	16656.001
6	0.119	0.136	0.120	0.075	1.433	24413.082
7	0.135	0.136	0.122	0.089	1.042	62401.455
8	0.148	0.138	0.145	0.095	0.776	23420.493
9	0.175	0.155	0.163	0.099	0.705	106976.342
High	0.283	0.168	0.204	0.120	0.520	51613.892

SGR has been calculated using formula as depicted by equation (3) in chapter 4.

6.2.1 Optimum lag length

The empirical results related to the regression equation as depicted by **model 3** (chapter 5) are presented in this section of the study. Since the nature of data is balanced panel, I apply a panel vector autoregressive (henceforth panel VAR) model to examine a causal relationship between SGR and stock returns. Previous studies on growth effect (Cooper et al., 2008 for asset growth and Lockwood & Prombutr, 2010 for sustainable growth effect) indicate towards a lead-lag relationship between growth measures and stock returns. Thus, I identify an appropriate lag length which is able to capture the cumulative impact of exogenous time series variables on endogenous time series variable. Irrespective of the various criteria that are available to define an optimum lag length, there is no actual directive to settle on a suitable lag order.

Table 6.2.1: Criteria for selecting appropriate lag order (endogenous variable: stock returns)

VAR Lag Order Selection Criteria

Endogenous variables: Stock Returns, SGR, Asset Growth, Return on Assets, BE/ME, dlog(Size)

Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2072.324	NA	7.51e-07	2.925	2.947	2.933
1	-537.455	3054.616	9.11e-08	0.816	0.971	0.875
2	-401.526	269.371	7.91e-08	0.675	0.966*	0.782
3	-301.158	198.052	7.23e-08	0.5849	1.006	0.742*
4	-263.766	73.470	7.21e-08	0.582	1.138	0.790
5	-181.358	161.219	6.76e-08*	0.517*	1.205	0.774
6	-146.387	68.121	6.77e-08	0.518	1.340	0.825
7	-118.026	55.006*	6.84e-08	0.529	1.484	0.886
8	-93.991	46.413	6.96e-08	0.546	1.634	0.953

* indicates lag order selected by the criterion

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 6.2.1 depicts the appropriate lag orders as suggested by Akaike information criteria (AIC), Schwarz information criteria (SIC) and Hannan-Quinn information criteria (HQ). As the financial year closing values of accounting variables are considered and stock returns being dynamic in nature cannot be presumed to be affected by these variables for a very long period of time, it is rational to follow the lag order as suggested by the Schwarz information criteria and Hannan-Quinn information criteria. The present research considers a lag length of 1 and 3, where the purpose of considering lag length of 1 is to study the impact of any change in growth on stock returns of the next year; lag 3 is considered to analyze the cumulative impact of any change in growth on subsequent stock returns for 3 years.

6.2.2 Regression specifications

I now examine the magnitude of the impact of SGR on stock returns. The regression specifications of **model 3** are depicted in table 6.2.2.

Table 6.2.2: Regression specifications for growth measures, BE/ME and firm size (endogenous variable: stock returns)

Variable	Coefficient	Std. Error	t-statistic	Probability
C	0.071	0.028	2.496	0.013**
SGR(-1)	0.086	0.038	2.265	0.024**
SGR(-2)	0.015	0.038	0.404	0.686
SGR(-3)	0.024	0.039	0.618	0.536
ASSETG(-1)	-0.231	0.062	-3.714	0.000*
ASSETG(-2)	-0.091	0.062	-1.460	0.144
ASSETG(-3)	-0.061	0.063	-0.963	0.335
ROA(-1)	0.210	0.193	1.090	0.276
ROA(-2)	-0.242	0.288	-0.840	0.401
ROA(-3)	-0.015	0.315	-0.049	0.961
BE/ME(-1)	0.053	0.007	7.983	0.000*
BE/ME(-2)	0.065	0.011	5.674	0.000*
BE/ME(-3)	0.046	0.011	3.930	0.000*
dlog(SIZE)(-1)	-0.055	0.038	-1.429	0.153
dlog(SIZE)(-2)	-0.059	0.038	-1.538	0.124
dlog(SIZE)(-3)	-0.172	0.038	-4.465	0.000*

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. SGR, ASSETG and ROA are abbreviations used for sustainable growth rate, asset growth and return on assets. BE/ME is the book-to-market ratio and SIZE refers to market capitalization of firms.

A positive value of t-statistic with 2.265 for SGR (-1) (with p-value of 0.024) for its one year lag indicates that a given increase in SGR induces an enhanced level of subsequent returns for shareholders. Though this result is inconsistent with that of Lockwood & Prombutr (2010), it fetches a reasonable justification. SGR allows firms to go for internal financing by way of retained earnings, thus enabling them through a reduced dependency of external sources (debt or equity). This creates confidence among existing shareholders of a firm as a result of which they not only hold their shares in the firm, but also seek to add new shares of the same firm in their portfolio. This is in line with Florou & Chalevas (2010) who argue that while valuing the firm's stock, investors consider the capacity of a firm to generate profits through its efficiency. Nevertheless, three lags of SGR (SGR (-3)) do not seem to be jointly significant as depicted by table 6.2.2. Similarly, three year lagged values of asset growth in the year t-2 and t-3 have no impact on the current year's stock returns.

The results presented in table 6.2.3 indicate that SGR is an important channel through which asset growth effect can be linked to stock returns. A higher SGR indicates an enhanced level of retained earnings. These retained earnings of a firm can be used for multiple purposes like reinvestment in new assets, acquisition of securities or retiring debt. Given that firms have expansion opportunities, a majority of this amount is directed towards the expansion of firms' asset base, referred to as asset growth. One year lag of asset growth (ASSETG (-1)) exerts a negative impact on firms' stock returns (t-statistics of -3.714 in table 6.2.2). These results are in line with Cooper et al. (2008) who also reported a significant negative impact of one year lagged value of asset growth on stock returns. Conversely, their three year lagged asset growth affect could not significantly predict stock returns (though the signs of the coefficients were as anticipated). The findings are also similar to Fairfield, Whisenant, & Yohn (2003) who documented an inverse relationship between stock returns and different types of asset growth (measured as net asset accruals and long-term operating assets in their study). A negative correlation between asset growth and stock returns can also be viewed in congruence with Berk et al. (1999) who posit a linkage between asset growth and systematic risk. They link dynamic turnover of assets in place with lower levels of systematic risk and expected returns. The movement from growth options to assets in place reduces risk, thus reducing expected returns. Yao et al. (2011) also confirmed a weaker but pervasive and inverse association between asset growth and subsequent stock returns.

Interestingly, the estimated coefficients and t-statistics of lagged values of BE/ME (t-1, t-2 and t-3) are positive and highly significant (0.000 p-value for all three lags). A given change in BE/ME has been documented to create an opposite directional impact on stock returns (refer Lockwood & Prombutr, 2010). Conversely, my outcomes are in line with Stattman (1980); Rosenberg et al. (1985); and Fama & French (1992) who support a positive association of average returns with book-to-market ratio. [8] A positive relationship between BE/ME and stock returns may also be driven by investor sentiment. High BE/ME of firms indicates that the stock prices of these firms have fallen and induces the investors to buy more shares, resulting in an improved level of stock prices.

6.2.3 Test of causality

There has been evidence of a co-movement of stock returns and various accounting and macroeconomic variables. Henry et al. (2004) provided evidence of a significant ability of returns to predict growth. A significant ability of asset growth effect to predict cross section of stock returns was reported by Cooper et al. (2008).

Table 6.2.3: Test of causality between growth measures, BE/ME, firm size and stock returns (endogenous variable: stock returns)

Panel A			
VAR Granger Causality/Block Exogeneity Wald Tests			
Dependent variable: Stock Returns			
Excluded	Chi-sq	Df	Prob.
Sustainable Growth Rate	5.131	1	0.024**
Asset Growth	13.794	1	0.000*
Return on Assets	1.187	1	0.276
BE/ME	63.730	1	0.000*
dlog(Size)	2.041	1	0.153
All	100.074	5	0.000*
Panel B			
VAR Granger Causality/Block Exogeneity Wald Tests			
Dependent variable: Stock Returns			
Excluded	Chi-sq	df	Prob.
Sustainable Growth Rate	1.599	3	0.660
Asset Growth	5.088	3	0.165
Return on Assets	9.257	3	0.026**
BE/ME	86.911	3	0.000*
dlog(Size)	40.313	3	0.000*
All	185.066	15	0.000*

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance.

I apply Granger Causality Test and results indicate a unilateral causal relationship between growth measures and stock returns.

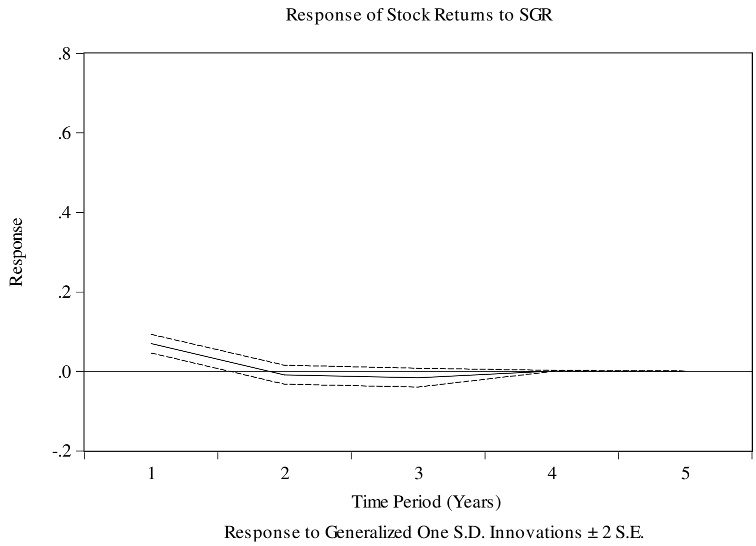
Panel A of table 6.2.3 depicts the existence of causality between stock returns and SGR, asset growth and BE/ME. Results show a significant ability of SGR, asset growth and BE/ME to cause fluctuations in stock returns in their first year lags (with p-values of 0.024, 0.000 and 0.000 for SGR, asset growth and book-to-market respectively). This implies that null hypothesis of no multivariate causality effect of these variables on stock returns cannot be accepted. SGR is a forward looking variable that investors might use as an anticipation tool to assess the future prospects of firms. Since this growth does not contains a market value component, it renders a rational justification of firms' cost containment ability, asset utilization efficiency and their financing strategy, all of which are vital parameters to be considered while examining firms' performance. The persistent performance advantage to firms causes their share prices to increase. The support to these arguments can be derived from Fama & French (2006) who state that more profitable firms have higher expected returns. Li et al. (2012) analyzed the relationship between asset growth and future returns and found the predictive power of two year asset growth rates to be more than one year asset growth rates. However, upon interpreting the values of panel B in table 6.2.3, this causality seems to disappear in the subsequent lags (p value of SGR and asset growth being 0.659 and 0.165 respectively in third year lag) of growth related measures.

The p-values related to the causal effect of stock returns on growth related measures (SGR, ASSETG and ROA) along with BE/ME and firm size are 0.640, 0.005, 0.961, 0.534 and 0.704 respectively (these reported results have not been tabulated in this study). However, no impact is found in case of ROA (at its first lag) and return in market capitalization as the p-value of chi square statistic is found to be more than 5% level of significance. In case of cumulative impact of three year lags, none of the exogenous variables except book-to-market and market capitalization seem to have any significant impact on stock returns (refer panel B of table 6.2.3). This result is apparent as it holds up to the premise of a heterogeneous exposure of stock returns to other factors over an extended time period.

6.2.4 Impulse response function

To further examine the robustness of my results, I examine the impulse response of stock returns to various exogenous variables. As the relationship between sustainable growth and stock returns is significant (chi-sq. value of 5.131 in first year lag and p-value of 0.024), it is important to observe the impact of sudden variations in SGR on subsequent stock returns. Considering unexpected movements in growth related measures and other variables included in the study, a unit change is applied to the errors and its effect on stock return is noted over time.

Figure 6.2.1: Impulse response of stock returns to shocks in SGR

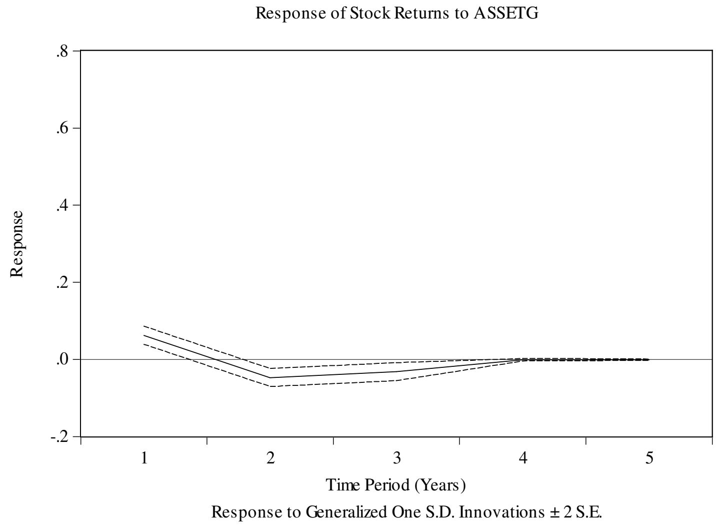


Source: Depiction based on author's calculations.

Results of impulse response are not surprising. A shock in SGR is seen to create an impact on stock returns of the firms (refer figure 6.2.1). This is indicative of the notion that markets discount future growth rate. Sudden alteration in this projected growth rate is reflected in the stock prices. However, this impact weakens gradually and diminishes within one year. This favours the argument of Tinic (1990) who contends that stock prices respond to reported figures comprising information about unforeseen changes in the probability distribution of future cash flows of firms.

Existing literature on asset pricing also underscores the existence of a time variant relationship between growth of assets and subsequent returns (Cooper et al., 2008). As evident from figure 6.2.2, variations in asset growth seem to cause a disorder in stock returns, though this effect is less rigorous as compared to the SGR impact.

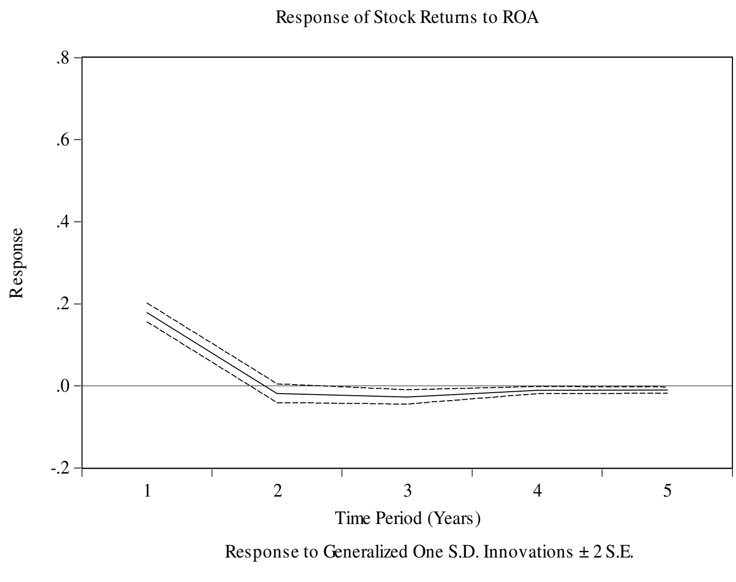
Figure 6.2.2: Impulse response of stock returns to shocks in asset growth



Source: Depiction based on author's calculations.

As depicted in figure 6.2.3, a shock in return on assets (ROA) brings a variation in stock returns. The impact is clearly visible over a period of one year. Since ROA can be decomposed into two important components, return on sales (ROS) and asset turnover (ATO) (refer Florou & Chalevas, 2010), its impact seems to be nullified by the SGR as the value of SGR offers an indication of the asset utilization ability of firm to generate profits from investments in its assets. As per the regression specifications depicted in table 6.2.2, ROA is not significant in explaining stock returns.

Figure 6.2.3: Impulse response of stock returns to shocks in return on assets

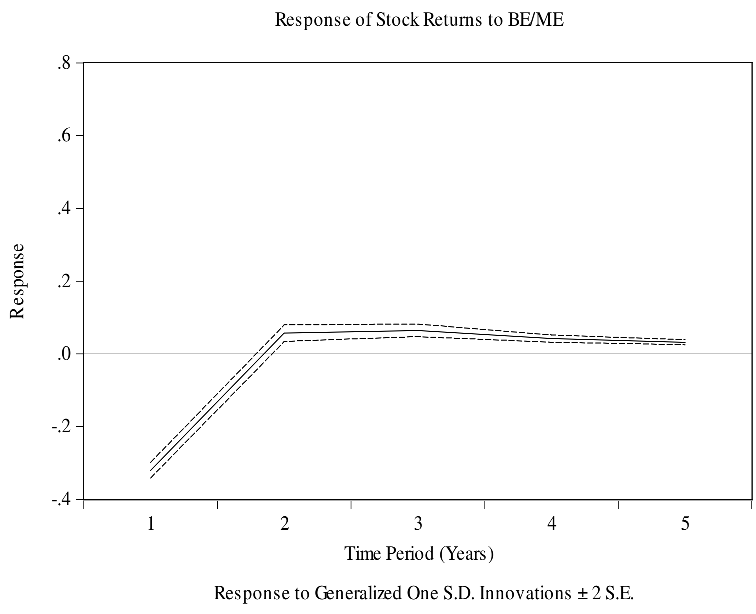


Source: Depiction based on author's calculations.

Results of impulse response function imply that a disclosure related to firm's operating performance (in its financial statements) influence stock returns. A support to this argument can be extracted from Florou & Chalevas (2010) who found that market participants (shareholders, investors, analysts etc.) consider accounting data while valuing the firm.

Book-to-market ratio (BE/ME) has been found to be highly correlated with the average returns of common stocks as Fama & French (1992 & 1995) argued in favour of BE/ME as a proxy of risk. In a study by Kyriazis & Christou (2013), market-to-book was found to be the only significant variable pointing towards a negative relationship with equity returns. Results of impulse response of stock returns to BE/ME are depicted in figure 6.2.4. Any shock in this ratio is seen to trigger a negative response of stock returns and carried over a period of one year. This is in harmony with studies of the BE/ME effect of Stattman (1980) and Rosenberg et al. (1985) who are well-known opponents of capital asset pricing model (CAPM) which states that expected returns are a positive function of risk. Balakrishnan (2016) exhibited the existence of factors like size, value (BE/ME) and momentum in the Indian stock market and found them to be advantageous investment approaches to capitalize on shareholders' wealth.

Figure 6.2.4: Impulse response of stock returns to shocks in book-to-market



Source: Depiction based on author's calculations.

Figure 6.2.5 displays the response of stock returns to a shock in firm size. It is clear that shock in firm size is highly persistent. However, this shock also turns insignificant after one year. The persistence of size shock fetches importance and can be attributed to the characteristic judgments of many scholarly studies (Fama & French, 1992, 1995, & 1996; Lockwood & Prombutr, 2010 and Balakrishnan, 2016). Firms having small size (or high BE/ME) have exceptionally high returns. Prominent evidence of this is the size effect of Banz (1981), who argued that firms with low market equity earn higher returns and average returns on large stocks were low.

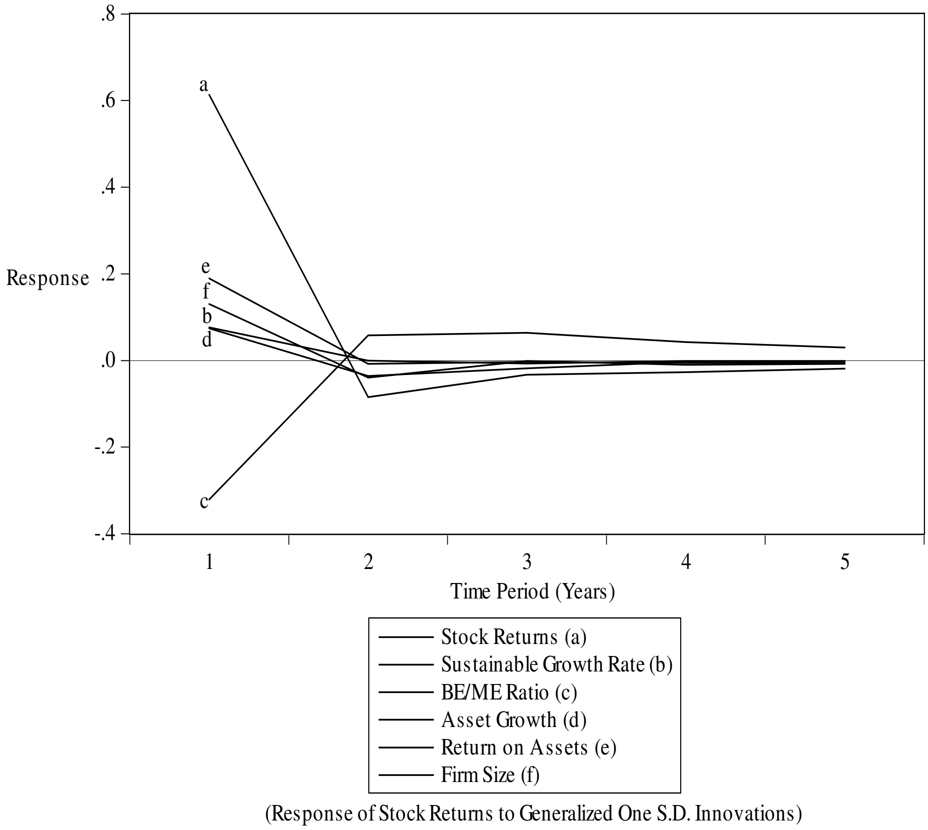
Figure 6.2.5: Impulse response of stock returns to shocks in firm size

Source: Depiction based on author's calculations.

The impact of firm size on stock returns (with a negative sign of slope and t-statistic as depicted in table 6.2.2) complements the results of other famous studies cited in this thesis. Chan & Chen (1988) provided evidence of size producing a wide spread of stock returns. Conditional volatility was found to have a limited effect on large capitalization stocks by Demir et al. (2016), though they found this impact to be relatively significant on small value (high BE/ME) stocks. Conversely, the study by Fieberg et al. (2016) reported a weak size effect in stocks in the German stock market.

The impact of shock in exogenous variables on stock returns is evident. Except in the case of BE/ME, the response of stock returns to shocks in exogenous variables was found to be positive. This outcome is a valid indication of value stocks being rarely glamorous but a safer investment option.

Figure 6.2.6: Impulse response of stock returns to shocks in growth measures, BE/ME and firm size (combined graph)



Source: Depiction based on author's calculations.

The combined impulse response function indicating the response of stock return is shown in figure 6.2.6. It is clearly demonstrated that stock returns significantly respond to different aspects of growth measures of firms, although, this shock lasts only for one period.

6.2.5 Variance decomposition

So far, results of previous research on asset pricing have been upheld in the current study. However, these statistically significant relationships require further examination. Since I apply an ARDL model, it is of interest to decompose the variance in stock returns caused by different variables included in the study. I estimate the proportion of changes in the endogenous variable (stock return) as a result of its own shocks and shocks due to other exogenous variables (growth related measures, book-to-market and firm size). Stock returns being dynamic in nature are affected by their own lagged values to a considerable extent. The results of variance decomposition analysis for the period of 5 years are shown in table 6.2.4.

Table 6.2.4: Decomposing variance in stock returns with respect to growth measures, BE/ME and firm size (endogenous variable: stock returns)

Variance Decomposition of Stock Returns							
Period	S.E.	Stock Returns	SGR	Asset Growth	Return on Assets	BE/ME	dlog(Size)
1	0.590	100.000	0.000	0.000	0.000	0.000	0.000
2	0.602	98.793	0.038	0.286	0.096	0.210	0.577
3	0.604	98.354	0.061	0.361	0.099	0.365	0.760
4	0.618	96.993	0.059	0.428	0.112	1.193	1.215
5	0.618	96.951	0.060	0.428	0.112	1.197	1.252

As expected, results of table 6.2.4 exhibit a substantial ability of lagged values of stock returns to define their subsequent levels. It is found that approximately 97 per cent of variation in stock return can be explained by its own shocks, 0.060 per cent of variation is due to SGR, 0.428 per cent of the variation is due to asset growth and ROA; BE/ME and Size contribute to the extent of 0.112 per cent, 1.197 per cent and 1.252 per cent of the variation in stock returns respectively. For stock returns of firms selected in the panel, approximately 3 per cent of the variation is explained by growth measures of firms. These results indicate similarity with those of Goyal & Welch (2006) who proposed that none of the conventional variables (accounting information variables) when used to predict stock returns have been able to match a straightforward prediction based on historical average stock returns.

Objective 3: To investigate the impact of sustainable growth on systematic risk of the firm.

In CAPM, beta as an estimation of systematic risk is the only security specific aspect that affects the return of a risky security (Mandelker & Rhee, 1984). A positive relationship between returns and firm beta is well established (Fewings, 1975; Hamid et al., 1994; Campbell et al., 2005; Lockwood & Prombutr, 2010). This relationship was contradicted by Fama & French (1992), which is considered to be another milestone in discussions related to firm betas. Conflicting conclusions were arrived at by Fewings (1975) and Myers & Turnbull (1977) regarding the effect of growth on risk as measured by beta. Lockwood & Prombutr (2010) attributed the sustainable growth effect to risk and not to mispricing. Following Carton & Hofer (2006) in measuring firm performance using an appropriate measure, I examine the ability of a dynamic measure of firm performance in predicting firm beta.

Literature supports that growth has an impact on systematic risk of firm. I test this assertion by way of hypothesis 3 formulated in chapter 4 of this study. Subsequent parts of my report discuss the results.

6.3.1 Optimum lag length

Before running the ARDL model, it is important to define the optimum lag length which is able to capture the cumulative impact of the exogenous time series variable on the endogenous time series variable. As already documented in section 6.2.1 of this chapter, there is no concrete directive for determining a suitable lag order. Table 6.3.1 highlights appropriate lags as suggested by Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ). Since the data used in the study involve year-end financial values of the variables under examination, it makes sense to go by the Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) as market betas being dynamic in nature cannot be assumed to be affected by variables for a very long period of time.

Table 6.3.1: Criteria for selecting appropriate lag order (endogenous variable: beta)

VAR Lag Order Selection Criteria

Endogenous variables: BETA; SGR; Asset Growth; Sales Growth; BE/ME; dlog (SIZE)

Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7936.999	NA	0.003	11.179	11.202	11.188
1	-6911.177	2041.537	0.001	9.786	9.942*	9.844
2	-6793.221	233.754	0.001	9.671	9.960	9.779
3	-6700.916	182.141	0.001	9.592	10.014	9.749*
4	-6651.408	97.275	0.001	9.573	10.128	9.780
5	-6591.109	117.966	0.001	9.539	10.227	9.796
6	-6532.708	113.762	0.001	9.507	10.329	9.814
7	-6486.021	90.548	0.001	9.492	10.447	9.849
8	-6448.249	72.940*	0.001*	9.489*	10.577	9.896

* indicates lag order selected by the criterion

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

6.3.2 Regression specifications

Having found an appropriate lag order, I now examine the co-variation results from the panel VAR estimation using growth measures, size and book-to-market as exogenous variables. The results of the ARDL model as depicted by **model 4** (in chapter 5) have been reported in table 6.3.2. The coefficient (-0.116) and t-statistic (-2.849) of SGR has a negative sign as expected and is statistically significant in third lag (p-value of 0.004). This indicates that firms with a higher rate of sustainable growth have lower levels of systematic risk. These results are quite consistent with Lockwood & Prombutr (2010) who state that higher sustainable growth firms tend to have low default risk and hence, lesser required returns.

Table 6.3.2: Regression specifications for growth measures, BE/ME and firm size (endogenous variable: beta)

Variable	Coefficient	Std. Error	t-statistic	Probability
C	0.752	0.036	20.933	0.000*
SGR(-1)	0.013	0.041	0.320	0.749
SGR(-2)	-0.003	0.041	-0.074	0.941
SGR(-3)	-0.116	0.041	-2.849	0.004*
ASSETG(-1)	-0.122	0.075	-1.628	0.104
ASSETG(-2)	0.002	0.073	0.028	0.978
ASSETG(-3)	0.163	0.072	2.268	0.023**
SG(-1)	0.001	0.011	0.114	0.909
SG(-2)	0.013	0.011	1.189	0.234
SG(-3)	0.024	0.010	2.316	0.021**
BE/ME(-1)	-0.023	0.015	-1.539	0.124
BE/ME(-2)	0.015	0.017	0.870	0.384
BE/ME(-3)	0.029	0.013	2.179	0.029**
dlog(SIZE)(-1)	-0.077	0.031	-2.449	0.014**
dlog(SIZE)(-2)	-0.022	0.031	-0.722	0.471
dlog(SIZE)(-3)	0.005	0.024	0.218	0.827

*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance. SGR, ASSETG and SG are abbreviations used for sustainable growth rate, asset growth and sales growth respectively for firms in the Indian manufacturing sector. BE/ME is the book-to-market ratio and SIZE refers to market capitalization of firms.

The coefficients and t-statistics of other growth measures are also significant at their respective third lag orders. However, the positive signs of coefficients and t-statistic of asset growth (0.163 and 0.024) and sales growth (2.268 and 2.316) point towards an increased level of risk with an increase in any of these growth measures. There has been a significant development in structural models of cross-sectional differences in risk premia. Therefore, it is important to check if the results of my study hold up to those of previous studies. Berk et al. (1999) argued that assets in place are less risky than growth options; therefore, growth option available to firms is liable to result in an enhanced level of systematic risk. Li et al. (2012) substantiated that a two year growth has a strong predictive power of stock returns which is subject to different robustness checks. Cochrane (1996) and Li, Livdan, & Zhang (2009) argue for the ability of systematic risk to explain asset growth. Taken together, my results support extant literature highlighting a positive and significant impact of asset growth on firm systematic risk. A positive impact of sales growth on firm betas can be attributed to the financing aspect of firms (Anthony & Ramesh, 1992). A given level of growth in sales requires investment in fixed assets. This may result in severe cash problems for managers. Equity financing ceases to be an option, especially for firms under financial distress. Debt financing in this case would increase the level of risk for existing shareholders. As excessive growth can create hardships for firms, SGR equips managers with a rationale to finance growth with an appropriate source of finance. I depict this in table 5.1 of chapter 5. Portfolios where sales growth exceeds the SGR portray potential cash problems for firms. This results in a higher demand of funds and may cause the level of risk to vary. Nonetheless, sales have been found to lower the level of systematic risk of the firm by McAlister, Srinivasan, & Kim (2007). I address this disparity in the following section of my study.

6.3.3 Test of causality

Literature provides evidence of two way causality between growth and risk. Application of Granger Causality Test in my study shows signs of one way causality between the variables in consideration. Probability values of VAR Granger Causality Test are reported in table 6.3.3. SGR, asset growth and book-to-market (p-values of 0.039, 0.051 and 0.002 respectively) are significant in causing variation in systematic risk of firms.

Table 6.3.3: Test of causality between growth measures, BE/ME, firm size and beta (endogenous variable: beta)

VAR Granger Causality/Block Exogeneity Wald Tests			
Dependent variable: BETA			
Excluded	Chi-sq	df	Prob.
SGR	8.368	3	0.039**
ASSETG	7.754	3	0.051
SG	6.750	3	0.080
BE/ME	14.491	3	0.002*
dlog (SIZE)	6.216	3	0.102
All	40.388	15	0.000*

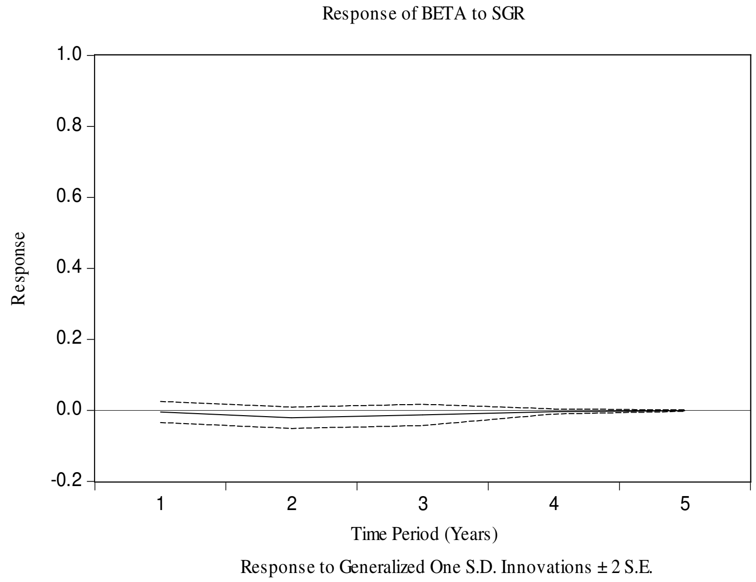
*Values are significant at 1 per cent level of significance. **Values are significant at 5 per cent level of significance.

The p-values of the ability of beta to cause variations in SGR, ASSETG, SG, BE/ME and SIZE in a three year lag are 0.224, 0.166, 0.694, 0.053 and 0.000 respectively (these reported results have not been tabulated in this study). These outcomes seem to provide an additional piece of evidence of the existence of two vital mechanisms of firm growth previously documented. First, high growth firms produce dissimilar risk premia as compared to lower growth firms. Second, the growth measures and the level of systematic risk do not exhibit two way behaviour between their co-movements. These results also replicate the well documented fact that book-to-market ratio can be used as an approximate measure of firms' growth opportunities.

6.3.4 Impulse response function

For the reason that this causal relationship is significant but not outsized, it seems reasonable to explore the association further. I test this relationship by way of impulse response function. Note that the regression coefficient of SGR and asset growth is more sensitive (table 6.3.2). Clearly, the growth effect is persistent. Interestingly, a unit shock in growth measures does not seem to impact beta considerably. However, only in case of book-to-market ratio, a unit change results in immediate shock in the risk. This impact dies out in a year's time and turns zero. My findings stand in contrast to those of Lockwood & Prombutr (2010). In their study, growth firms displayed higher levels of risk.

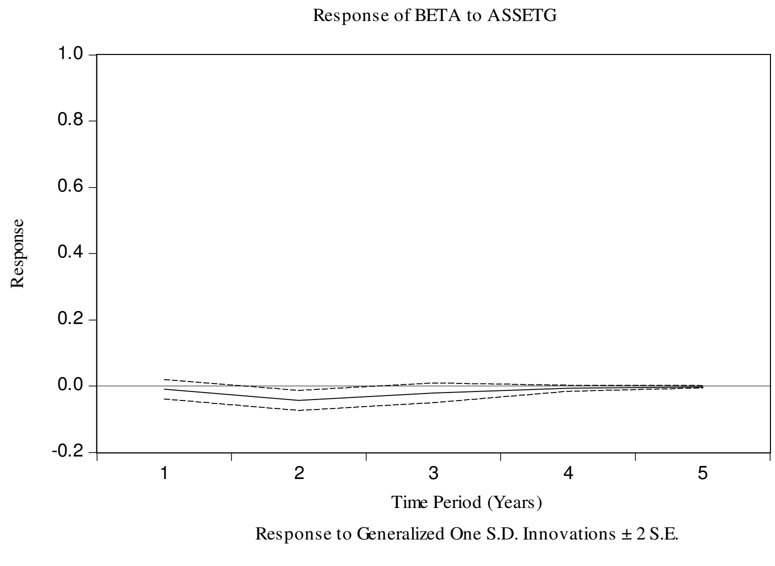
Figure 6.3.1: Impulse response of beta to shocks in SGR



Source: Depiction based on author's calculations.

In section 6.2.4 of my report, I proposed that markets discount future growth rate (SGR). A shock in this projected growth rate is reflected in the stock prices. The depiction of impulse response of beta to SGR (figure 6.3.1) opposes my proposition. Level of systematic risk shows no variation in response to unit shock in SGR. Nonetheless, this is not surprising. I acquire justification from Lockwood & Prombutr (2010) who assert that sustainable growth cannot explain the cross section of risk adjusted returns within a time-varying risk framework.

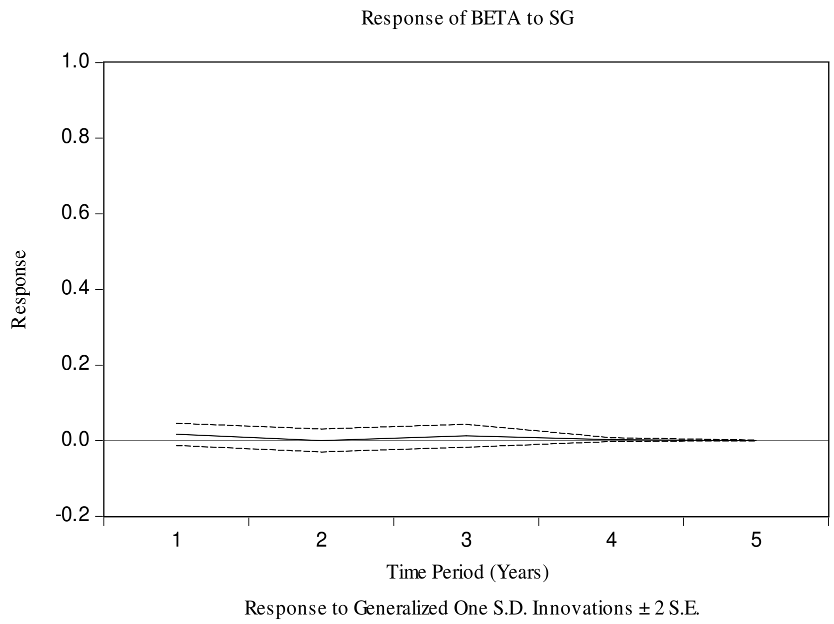
Figure 6.3.2: Impulse response of beta to shocks in asset growth



Source: Depiction based on author's calculations.

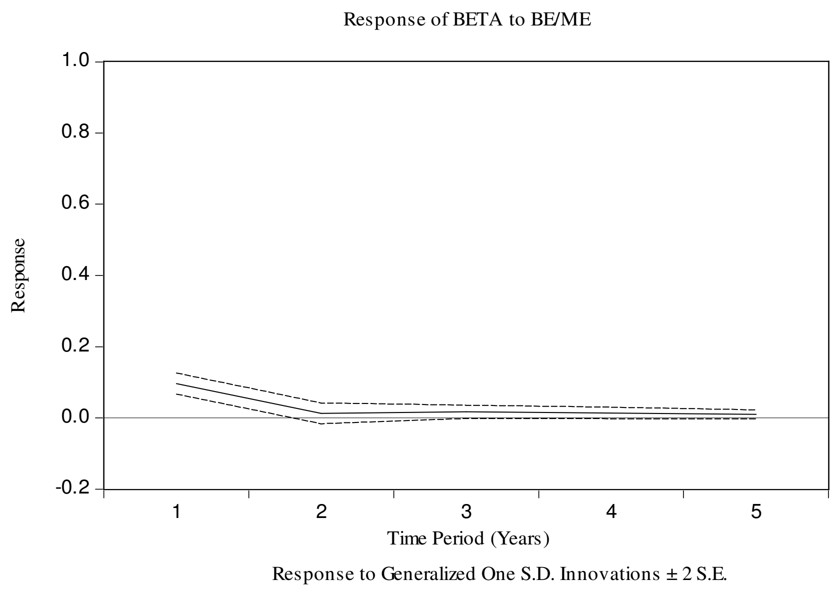
Systematic risk does not seem to be affected by a shock in asset growth. As previously documented, asset growth effect to cause variations in beta in a third year lag (table 6.3.2) is significant. With similar findings, Cooper et al. (2008) reported five year growth to be negatively and significantly associated with beta. However, figure 6.3.2 shows a feeble ability of shock in asset growth to cause variations in the level of firms' systematic risk. Hence, a priori, asset growth effect is important, but not completely exclusive.

Figure 6.3.3: Impulse response of beta to shocks in sales growth



Source: Depiction based on author's calculations.

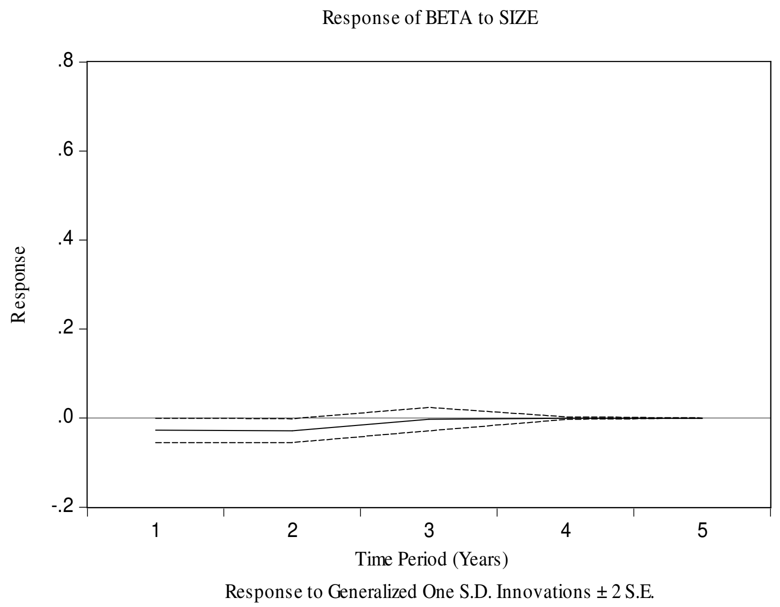
Figure 6.3.4: Impulse response of beta to shocks in book-to-market



Source: Depiction based on author's calculations.

Firm betas do not seem to be affected by shocks in sales growth (figure 6.3.3) and firm size (figure 6.3.5). However, a shock in BE/ME is seen to create a variation in firm betas and this impact exists for a period of one year (figure 6.3.4). My results are in line with those of Fama & French (1992) who argued that a dimension of risk was associated with book-to-market ratio. My finding conforms to existing literature that states that level of risk increases with an increase in BE/ME. My results are in line with the value premium (high BE/ME) empirically observed by Chan & Chen (1991) who proposed risk captured by BE/ME as a relative distress factor of firms.

Figure 6.3.5: Impulse response of beta to shocks in firm size

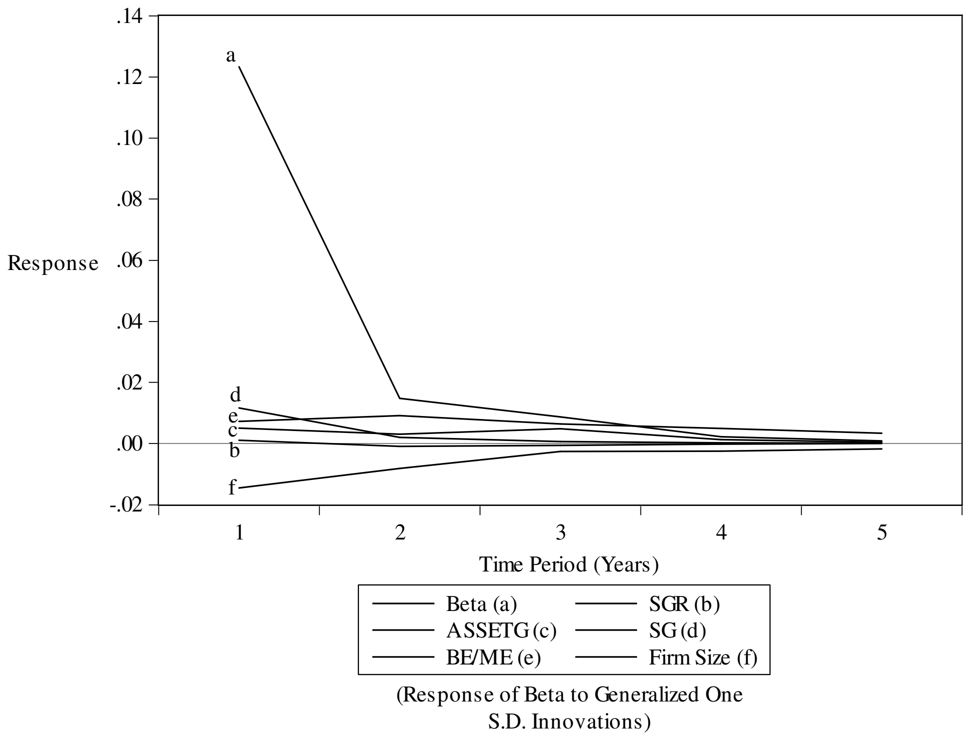


Source: Depiction based on author's calculations.

Impulse response of beta to other variables is negligible, (refer figure 6.3.1, 6.3.2, 6.3.3 and 6.3.5) except in case of BE/ME. However, the coefficients of the growth variables used in **model 4** show empirical significance and are also effective in the presence of strong contenders like book-to-market ratio and firm size. The rationale for these results is that the stochastic properties of risk are not conclusive. This is in line with the results of study by Yao & Gao (2004). I test this stochastic property of risk using variance decomposition in section 6.3.5.

Figure 6.3.6 depicts the combined response of beta to shocks in SGR and other variables under consideration. As the main test variable, SGR impact seemed to be weak though this impact was evident in case of stock returns (refer figure 6.2.6).

Figure 6.3.6: Impulse response of beta to shocks in growth measures, BE/ME and firm size (combined graph)



Source: Depiction based on author's calculations.

6.3.5 Variance decomposition

After dealing with the aptness of the model used and the degree of causality among the variables, I now test if my growth measures have the ability to cause variations in beta in its own sphere of influence.

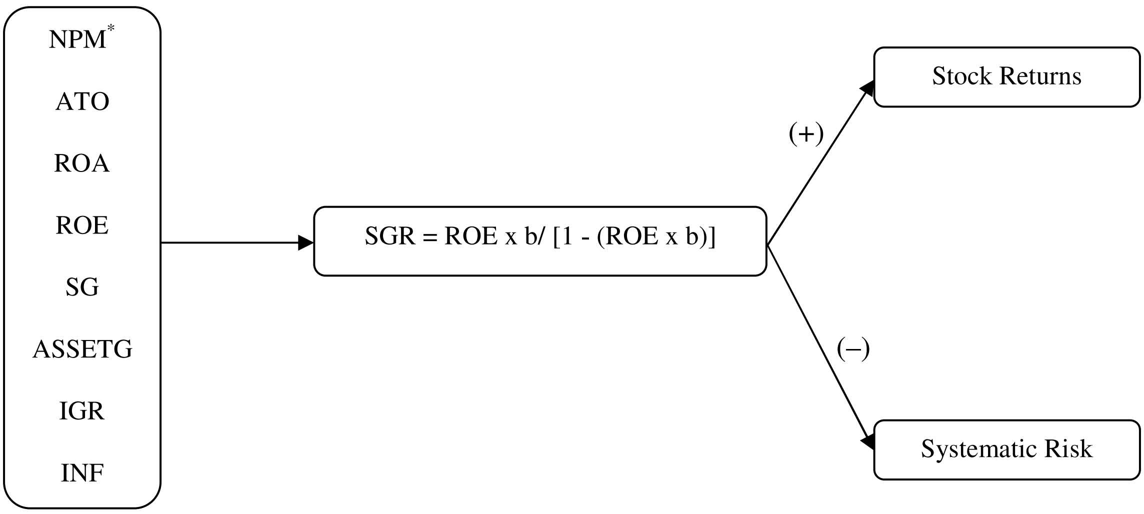
Table 6.3.4: Decomposing variance in beta with respect to growth measures, BE/ME and firm size (endogenous variable: beta)

Variance Decomposition of BETA							
Period	S.E.	BETA	SGR	Asset Growth	Sales Growth	BE/ME	dlog (SIZE)
1	0.674	100.000	0.000	0.000	0.000	0.000	0.000
2	0.688	99.559	0.086	0.152	0.001	0.009	0.193
3	0.689	99.425	0.097	0.166	0.054	0.021	0.237

Evidence from variance decomposition of betas suggests that in a three lag variation of firm betas, 99.43 percent of variation has been caused by its own previous values while growth measures under consideration, *viz.* SGR, asset growth and sales growth cause 0.097, 0.166 and 0.054 percent of the variance in betas respectively. Book-to-market ratio and firm size induce nominal impact on betas when considered as exogenous variables in regression **model 4**. Although there are clear connections, it is notable that firm growth measures do not seem to exert a sizeable impact on firm beta. The results of this study point towards a pertinent statement given by So & Nyerges (1995) according to which, the insignificant relationship of variables with risk can be a result of multicollinearity among variables like dividend payout, leverage and firm size. Since SGR comprise a portion of all these variables, it makes sense that this association be fragile. Conversely, it may be naive to portray this multicollinearity as the major driving force behind a fragile linkage between growth measures and systematic risk. Therefore, a possibility to deny the stochastic characteristics of risk can be ruled out and requires further investigation.

To conclude my empirical findings, I highlight my empirical model developed (figure 6.5) on the basis of the results of panel data regression analysis.

Figure 6.5: Empirical model: Determinants and impact of SGR on stock returns and systematic risk



→ Linking independent and dependent variables

(+) depicts positive relationship; (–) depicts an inverse relationship

*NPM has been found to have a significant impact on sustainable growth in **model 1** and **model 2**

Source: Developed by author based on empirical analysis.

Inferences drawn from empirical results are discussed in chapter 7.

CHAPTER 7

DISCUSSION

I now provide an insight into my results. My effort is motivated by Carton & Hofer (2006) who sought to develop an improved measure of overall organizational performance. To be more specific, I extend their sub-categorization of accounting measures as profitability measures, growth measures, leverage, liquidity, and cash flow measures. In doing so, I examine a dynamic measure of firm performance in the form of SGR. I also test its outward ability to influence returns and systematic risk. Thus, I revisit the asset pricing paradigm and offer strong empirical manifestation of a relationship of firm performance with its returns and risk.

Objective 1: To examine the approaches of calculating sustainable growth and analyzing the impact of its determinants.

An area of concern regarding SGR models is their dependability. Various authors have proposed their SGR calculation models to remain well specified across business cycles and market conditions. I first examine the power of two well specified models of SGR. I evaluate Babcock's (1970) model in comparison to that of Angell (2011). It turns out that these models produce similar results. Nonetheless, this similarity is only superficial. My results suggest an inconsistency between these models when it comes to observing their ability to capture firm specific characteristics.

I attempt to understand this inconsistency using fixed effect and random effect models in my analytical framework. A critical finding by way of **model 1** and **model 2** suggests that SGR calculation using Angell's (2011) formula captures firm and industry specific characteristics. My results do not favour Babcock's (1970) formula of change in book equity as a good measure of SGR. This is an important finding. Higgins (1977); and Platt et al. (1995) also believed in SGR to significantly vary because of firm specific characteristics. My rationale follows Johnson (1981) who indicated the existence of varied SGR in an inflationary environment. My finding gets strengthened with Collins et al. (1999) arguing against the role of change in book equity as a measure of scale differences. Book equity reported as a negative number also receives criticism from Brown et al. (2008). I argue against its utility to capture profitability, efficiency and leverage of firms. Results of **model 1** (refer table 6.1.5) provide evidence of the applicability of fixed effect model when examining determinants of SGR calculated using Angell's (2011) formula. Suitability of random effect model (**model 2**) where SGR is calculated using Babcock's (1970) formula substantiates the inadequacy of this method to capture firm and industry specific characteristics.

Given the prevalence of SGR in evaluating firms and industries, I highlight its various determinants. Though higher growth is appreciated, its occurrence can always be planned. Existing research has explored the possible association of firm level and industry level characteristics with various forms of growth. In particular, evidence is available for the relationship among firm characteristics and behaviour of SGR (Babcock, 1970; Higgins, 1977; Platt et al., 2011 and Angell, 2011). A discussion on macro economic factors affecting SGR is apparently missing (except Johnson, 1981). I develop **model 1** and **model 2** in response to the lack of studies discussing determinants of SGR.

To the extent that SGR acts as a proxy for firm efficiency, one would expect it to vary as a result of internal and external factors. Considering the results of multivariate analysis in chapter 6 (table 6.1.6), industry specific factors like industrial growth and inflation seem to be unable to influence SGR of firms within that industry. Thus, it cannot be established that SGR varies as a result of external factors, and it turns out to be a purely internal phenomenon. A closer look at regression specifications reveals that NPM fuels the SGR of firms. The only explanation that captures this is the affine function of operating and financing efficiencies in firm profitability.

Objective 2: To investigate the impact of sustainable growth on stock returns of the firm.

An important piece of the asset pricing puzzle is stock return predictability. I aim to extend the study of Lockwood & Prombutr (2010) who considered the implications of SGR variations on firms' subsequent returns and level of beta. However, I claim superiority in two aspects. First, I consider cross sectional and time series elements by using panel data. Second, I test a lead-lag relationship of SGR with returns and risk. To examine the robustness of my results, I introduce well established predictors of returns like BE/ME and firm SIZE as other explanatory variables. **Model 3** appears to be well equipped to test my hypothesis of a positive association between SGR and stock returns. Not surprisingly, the causality between SGR and stock returns is evident. What is more interesting is that firm SIZE develops redundancy in explaining subsequent returns in the presence of SGR. The magnitude of co-movement of SGR and stock returns is economically significant (refer table 6.2.2 and table 6.2.3). Taken together, results establish SGR as a deterministic phenomenon.

Within the predictive coefficients, I illustrate the nature of time variation of growth variables. I perform impulse response analysis for **model 3** (refer figure 6.2.6). Various aspects of firm growth exhibit different patterns in influencing stock returns. Though the impact of shock in SGR lasts for one period, it induces considerable change in stock returns. Asset growth effect has developed a reputation to influence stock returns (Cooper et al., 2008). I route my SGR impact on stock returns through the asset growth effect. Perhaps the most intriguing feature of figure 6.2.6 is the dominance of SGR affect on asset growth effect.

To provide more detail to my examination, I test the claim of Goyal & Welch (2006) that none of the conventional accounting variable beats a straightforward prediction of returns based on their historical values. My results of variance decomposition (table 6.2.4) confirm that their claim cannot be easily dismissed. Nonetheless, I do not undermine the ability of my growth measures to dictate stock returns. SGR holds the promise of being much more an effective measure predicting stock returns. My results do not second those of Lockwood & Prombutr (2010). In summary, I find that SGR demonstrates the ability to predict future stock returns with one year lag of SGR showing greatest predictive power. I propose that investors seeking profits should invest in high SGR firms.

Objective 3: To investigate the impact of sustainable growth on systematic risk of the firm.

Literature examining the predictability of growth-risk relationship remains considerably inconclusive. My results, while directly contributing to the literature on stock return predictability, in particular, also include a discussion that links growth to the level of risk (beta). I calibrate **model 4** using an almost similar set of variables as used in **model 3** (with sales growth replacing return on assets). I document the existence of a significant growth effect on firms' systematic risk.

I employ a battery of tests to determine how different growth measures of a firm affect its level of systematic risk. My rationale to examine a causal relationship between growth and risk follows that of Durand (1957). While it is only logical to assume that such causality exists, it varies with time and is also affected by the heterogeneity of cross sectional units. Motivated by Lockwood & Prombutr (2010), I extend the use of SGR in defining systematic risk. These measures seem to be significantly correlated. The idea that growth opportunities and assets in place have different risk exposures is not new (Berk et al., 1999 and Gomes et al., 2003). My work complements related literature by illustrating how growth related shocks affect risk. In particular, there exists some evidence of an inverse relationship between SGR and risk (Lockwood & Prombutr, 2010). Although an evidence of a contrary relationship is missing, the association is worth exploring. Results of regression analysis (table 6.3.2) suggest that my growth measures (SGR, ASSETG and SG) have a significant ability to detect firm beta. However, none of them reflects an outsized predictive ability. Surprisingly, firm SIZE fails to influence firm beta. As a robustness check, I consider another proxy of risk in the form of BE/ME ratio. Taken together, the results of table 6.3.2 and table 6.3.3 reasonably contradict (Li et al., 2012) who stated that growth effect is consistent with some market mispricing.

It is not surprising to find that high SGR firms tend to have lower systematic risk. The foundation of this result is the fact that firms' financing costs decline as a result of enhanced level of SGR. My model retains the characteristics that one would expect to observe in a growth environment. For example, growth in assets and sales seem to increase risk (table 6.3.2). This is in line with Anthony & Ramesh (1992) and Li et al. (2012) who demonstrated sales growth, asset growth and systematic risk to be positively correlated.

Regression specifications, though significant, are not outsized. However, the empirical success motivates me to examine this relationship further. Do growth fluctuations cause beta to fluctuate? I consider this question by allowing for simultaneous shocks in growth measures and analyzing the impact on firm beta. Response of beta to shocks in exogenous variables (except BE/ME) is feeble. As my main test variable, SGR does not seem to exert a noticeable impact on firm beta in the first and second order lags.

Now I discuss important findings of my study. First, Angell's (2011) formula for SGR calculation is appropriate and provides accurate results. Second, firms with higher levels of SGR have higher required returns. Third, high SGR firms tend to have lower subsequent levels of beta. Hence, high SGR firms prove to be safer investment options for investors. A summary of the empirical results is given in **Appendix 2**. Subsequent sections discuss conclusions, suggestions, limitations and implications of the study. Scope for future research in the area of SGR and asset pricing is also highlighted.

CHAPTER 8

CONCLUSION AND SUGGESTIONS

This research is an attempt to address several important issues. First, I address the inconsistency in SGR calculations. I compare two different methods of calculating SGR and also examine its determinants. Second, I analyze the impact of SGR on firms' stock returns. Third, I investigate the impact of SGR on firms' level of systematic risk.

8.1 Conclusion

The phenomenon of SGR is well appreciated in financial texts. However, there has been far less progress in theoretical analysis related to the inconsistency of results arrived at using alternative methods of its calculation. The factors determining this growth rate are also not well understood. I shed new light not only on the determinants of SGR but also propose a better way of its calculation. I show evidence of the promising role of Angell's (2011) formula (using ROE and retained earnings) in calculating SGR. I also examine what external forces can do to this growth rate. My study also corroborates the role of variations in book equity (Babcock, 1970) in estimating the SGR. Thus, the first unique aspect of my research is a comparison of the different methods of calculating SGR. Apart from this, I seek to establish its determinants. Accordingly, I report several major findings.

The message from multivariate regressions is not surprising. Clearly, net profit margin fuels the sustainable growth of a firm. Assuming adequate growth opportunities, firms reluctant to issue new equity can support their sales growth with a corresponding growth in assets financed by retained earnings. This is also evident from the behaviour of asset growth in relation to the increasing order of SGR portfolios. Nonetheless, all this is determined by the level of profits available with a firm. These results are consistent across industries and methods of calculating SGR. I also report the feeble affect of sales growth and profit retention ratio on SGR. This rejects the notion that an increase in sales always enhances a firm's profitability. The results remain unaffected even after introducing external variables like industrial growth and inflation in the regression models. Also, they do not vary with the method used to calculate SGR. I recommend Angell's (2011) method of calculating SGR. It proves fruitful when industry or firm specific aspects are to be considered (firms operating in same or varied industries). On the contrary, Babcock's (1970) formula provides an aggregate view of the SGRs without considering firm or industry specific factors.

Moving to asset pricing perspective, I find a significant positive impact of SGR on stock returns of firms. This is because the market recognizes the future growth potential of firms. Investors always like to buy shares with better growth prospects. Lockwood & Prombutr (2010) also reported a significant impact of SGR on stock returns of firms. Many researchers contend the ability of past performance indicators of firms to explain subsequent returns. Cross sectional analysis of the relationship of variables like BE/ME and size (Fama & French, 1992), asset growth (Cooper et al., 2008), fixed asset revaluations (Ghicas et al., 1996), intangible assets (Nelson, 2006) and sales growth (Anthony & Ramesh, 1992) with stock returns have long shaped the thinking of practitioners and researchers. Past performance may not be carried forward by firms in this era of dynamic business turmoil. This raises questions on the utility of such performance indicators in estimating subsequent stock returns. The possibility of a causal relationship between growth potential of firms and stock returns warrants new research. I fill this research gap and establish a robust and future oriented performance indicator in the form of SGR to explain future stock returns of firms. This qualifies as the second unique contribution of my study.

My study supports the results of previous studies that discuss different aspects of firm growth. Results of my study are in line with those of Cooper et al. (2008) who reported asset growth as a strong predictor of future stock returns and highlighted a negative relation between the two. Yao et al. (2011) also argued in favour of a negative relation between asset growth and stock returns. Similar results were reported by Li et al. (2012) who found two years' asset growth effect to be particularly strong in predicting returns. However, the results of my study contradict to findings of some. My results do not second the significant results of Lockwood & Prombutr (2010) who argue that higher sustainable growth firms tend to have lower required returns. Also, in doing so, I establish asset growth effect as a vital link between SGR and stock returns.

I develop a practical framework that outlines the categories of growth measures that could influence stock returns. Incorporating an analysis of Indian manufacturing firms listed on the NSE, my framework lays the guidelines to study the impact of SGR on stock returns. SGR is a unique performance assessing concept as it is forward looking in its approach; most traditional measures of firm success are based on the past performance of a business. My research reports important findings for policy makers and investors. Contrary to the results of (Lockwood & Prombutr, 2010) who argue that high sustainable growth firms tend to have low subsequent returns, I show that an increase in SGR results in an increase in stock returns.

I attribute this effect to an increased level of perceived risk by investors in relation to asset growth. Higher SGR is a result of higher return on investments. This provides an opportunity to the firm to expand its asset base. As evident from review of literature, asset growth is associated with level of systematic risk (Li et al., 2012). An enhanced level of assets in place also poses a potential risk for investors and thus results in higher expected future returns. To sum up, the findings indicate that SGR and asset growth are significant determinants of stock returns and should be integrated into asset pricing models.

I also provide an understanding of the utility of the concept of growth and its impact on the level of systematic risk of firms. Using panel data of firms spread across nine industries in the Indian manufacturing sector, panel VAR model depicts the impact that growth exerts on risk. I find that higher growth in assets and sales leads to increased levels of risk. However, SGR - a parameter that notifies the ability of the firms to afford their growth - seems to fulfil its desired role. High sustainable growth firms tend to have lower levels of risk. This connotation appears to be relevant with a higher SGR; firms are able to finance their growth internally - which gives them the capability to avoid sourcing funds from the market. This result is in conjunction with Lockwood & Prombutr (2010). The proposition of growth options being more risky than assets in place also stands proved with the third year lag values of asset growth being more risk inducing than the first year lags. Li et al. (2012) argued that the predictive power of two year asset growth rate was more than that of one year asset growth rate. The findings are relevant to managers who think that growth is always beneficial. My growth-risk relationship may not only attract managers, but also investors. When integrated in asset pricing studies, growth measures can also help investors to better time their trading strategies. This qualifies to be the third contribution of this study. The co-movement of book-to-market ratio and risk lends rationale to managers and researchers in proposing BE/ME as a proxy of risk. A comparison of SGR of firms in different industries also provides the managers an insight on their growth sustainability practices getting affected by the internal as well as the external environment. This is the fourth noteworthy contribution of this study. I remove ambiguity related to the appropriate method of SGR calculation. This is my contribution towards the enhancement of the academic understanding of the concept.

The Fama-French three-factor model has immense credibility among practitioner communities. Its conceptual linkage with asset pricing has been recommended to institute constructive results related to critical examination of stock returns. My research upholds some postulates of their model along with other asset pricing theories. I establish significant linkages between SGR, stock returns and systematic risk. In doing so, I also find asset growth as an important variable determining asset prices. Thus, I successfully demonstrate the ability of a relatively less explored but an important variable in the form of SGR to determine subsequent stock returns. I establish independent variables that can significantly predict stock returns. Dimensions discussed in regards to growth-return relationship will allow financial managers to pursue realistic growth opportunities and accordingly put in place an appropriate financing policy for the firm.

8.2 Suggestions

Based on an empirical analysis of the variables under consideration, I propose the following suggestions for appropriate SGR calculation and safer investments:

1. SGR calculated using Angell's (2011) method (using ROE and profit retention ratio) will provide better insights to managers and investors as it considers firm specific variables. It is recommended to use the formula given in equation (3) to calculate SGR as it incorporates the impact of firm specific variables.
2. Change in book value of equity taken on year on year basis (Babcock, 1970) has a tendency of providing an imprecise figure of SGR.
3. Firms operating in industries with higher levels of growth (measured by IIP) tend to have higher SGRs. Higher SGR firms are safer investment options and provide high capital appreciation. Investors are advised to consider this aspect while investing.
4. Growth levels of the current year have an impact on the stock prices of the subsequent year. Firms with higher SGRs have higher subsequent returns. It is better to invest in firms with higher SGRs.
5. High SGR firms have lower levels of systematic risk; hence, turn out to be safer investment options for investors.

There was a strong need of precision on issues related to calculation of SGR. Although financial literature contains explanations on the concept of SGR, yet, there is a scarcity of notable studies suggesting the use of an appropriate formula for its calculation. Moreover, the factors affecting SGR have not been discussed in these studies. I overcome this limitation and provide a rational ground for assessing the SGR of firms. I also explore the impact of SGR on asset prices and systematic risk which seemed missing to a considerable extent in literature.

LIMITATIONS AND SCOPE OF FUTURE RESEARCH

My study is limited to manufacturing firms in India which were listed on the NSE during the period 1998 to 2014 (including the recession). The effects of the recession on empirical results, if any, have not been explored. The volatility of returns in the Indian stock market has been higher in the crisis period with lower mean returns as compared to the post crisis period (Verma & Mahajan, 2012). A similar study was conducted by Sakthivel, Raghuram, Veerakumar, & Sumathisri, 2014) and matching results were documented. A study on the pre-crisis and post-crisis behaviour of variables under consideration could offer significant insights.

Firms with missing values of the required variables for the sample period have not been considered in the study. Moreover, the firms selected for the present study belong to one country alone - India.

The results pertaining to hypothesis 1 are based on aggregates calculated as averages of variables of firms operating within selected industries in the Indian manufacturing sector. Examining the inter-relationship of these variables for service firms may be worthwhile. I propose such examination due to difference in the composition of assets between firms operating in manufacturing and services sectors.

I consider exogenous variables in the form of SGR and growth in total assets. The appropriate calculation of these variables is considered to be on year on year basis. However, variations in returns over a period of one year may absorb information related to the macroeconomic aspects affecting firms, which remains unexplored in this study.

Scarcity of previous research on SGR and asset prices is also a limitation of the study. This deficiency produces a possibility that I have overlooked an important channel pertinent to the study. Though absence of previous research provides rationale for the current study, it also brings inadequacy of rationalization.

Finally, unsystematic risk remains a missing element of this study. To establish whether the results of growth-risk relationship hold in practice, an empirical analysis involving unsystematic risk demands attention. This should provide meaningful inferences to managers, investors and researchers while evaluating risky firms.

However, the usefulness of this study cannot be undermined due to these limitations. The results of my research provide insights to extend the efficacy of the phenomenon of SGR. I do this by contributing towards three important aspects. First, I suggest a suitable method SGR calculation. Second, I examine the lead-lag relationship between growth measures and stock returns and provide evidence that growth is adequately priced. Third I examine an inter-relationship between SGR and firm betas which was missing in financial literature. With the support of results that provide an indication of a significant relationship between growth measures and stock returns, the concepts discussed in this research can be beneficial to investors in making safer investments and to managers for better policy formulation. Future investigations may replicate this study in other contexts to generalize its results.

END NOTES

[1]. In order to examine the impact of sustainable growth correctly, firms from the manufacturing sector have been selected. Firms from the non-manufacturing sector differ significantly in capital structure and asset mix (Mayo & Jarvis, 1992 and Kyriazis & Christou, 2013).

[2]. Platt et al. (1995) used beginning of year equity in their formula for sustainable growth; however they did not provide any justification why they used the beginning of year value. Firer (1999) while calculating asset turnover ratio for assessing sustainable growth also used opening values of net assets (again no justification provided for this). On the contrary, Ulrich & Arlow (1980) used closing values for all calculations.

[3]. This study considers SGR calculated using the formula suggested by Angell (2011) as depicted in equation (3) as an independent variable to examine its relationship with stock returns (objective 2) and systematic risk of the firms (objective 3).

[4]. Financial year closing share prices are considered after taking into account changes like stock dividend, right issue and stock split. The figure of adjusted stock prices has been extracted from the 'Prowess' data base of CMIE.

[5]. Market capitalization (market price of shares times number of shares outstanding) has been converted into natural logarithmic values so that the data are even out as other variables being ratios are in small values.

[6]. SGR is defined for firms and not industries. Data depicted in the table is the average data of firms in that industry and is representative of a typical firm in the industry (refer Platt et al., 1995).

[7]. A support to this argument comes from Platt et al. (1995) who analyzed sustainable growth of firms in financial distress.

[8]. Fama & French (1996) argued that higher returns for high BE/ME stocks reflect compensation for risk. Fama & French (1998) provided comparable confirmation for 12 major markets for the 1975 to 1995 period. Arshanapalli, Coggin, & Doukas (1998) in support of this view provided international evidence on 18 countries for the period of 1975 to 1995.

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Appendix 1: Sample with distribution of firms by industry

Division number of industry as per NIC codes (2008)[#]	Industry description	Sample	
		No. of firms	%
20	Chemicals & chemical products	56	27.59
41	Construction materials	19	9.36
26	Consumer goods	12	5.92
10	Food & agro based	21	10.34
28	Machinery	32	15.76
24	Metals & metal products	13	6.40
13	Textiles	16	7.88
29	Transport equipment	24	11.82
32	Miscellaneous manufacturing	10	4.93
	Total	203	100.00

[#] This table depicts the broad classification of industries and their division number as per the National Industrial Classification (NIC) codes taken from the NIC Code document of 2008 prepared by Central Statistical Organization (CSO), Ministry of Statistics and Programme Implementation, Government of India. However, detailed sub-classification of industries has not been considered since it is not pertinent to the study as the primary purpose of the study is to examine the inter-relationship of financial variables and not analyzing the industry specific aspects.

Appendix 2: Summary of empirical results

S. No.	Summary of empirical results
Objective 1	***To examine the approaches of calculating sustainable growth and analyzing the impact of its determinants*.**
1.1	There is a high degree of correlation between SGRs calculated using two different formulas.
1.2	SGR calculated using Angell's (2011) formula captures the firm specific factors while SGR calculated using Babcock's (1970) formula provides an aggregate view (neglecting firm specific factors), thus depicting that variation across SGR of different firms are random (result of a chance).
1.3	The net profit margin of the firms fuels the SGR of the firms. Among the external variables, none of them shows significant ability towards affecting the SGR (in fixed effect model). However, SGR of the firms seems to be affected by industrial growth in case of random effects model.
1.4	Nonetheless, in case of random effects model, estimators do not seem to be biased as none of the independent variables are significantly correlated with the error term.
Objective 2	***To investigate the impact of sustainable growth on stock returns of the firm*.**
2.1	The growth effect seems evident till the first order lag of SGR. One year lag values indicate that a given increase in SGR induces an enhanced level of subsequent returns for the shareholders. However, this effect diminishes towards subsequent lags. It signifies that growth levels of current year have an impact on the stock prices of the subsequent year.
2.2	One year lag of asset growth exerts a negative impact on firms' stock returns. The movement from growth options to assets in place reduces risk, thus reducing the expected returns.
2.3	A higher level of BE/ME results in an improved level of subsequent stock prices for the firms.
2.4	Test of causality provides evidence that stock returns are caused by factors like SGR, ASSETG and BE/ME. But no causality appeared when returns were tested to cause variations in the said variables. Thus, there is one way causality between SGR, ASSETG & BE/ME and stock returns.

2.5	A shock in SGR is seen to create an impact on stock returns of the firms. This is indicative towards the notion that markets discount future growth rate and any alteration in this projected growth rate is reflected in the stock prices. However, this impact weakens gradually and diminishes in a year's time.
2.6	Stock returns being dynamic in nature are affected by their own lagged values to a considerable extent. For stock returns of firms selected in the panel, approximately three per cent of the variation is explained by growth measures of the firms.
Objective 3	***To investigate the impact of sustainable growth on systematic risk of the firm.***
3.1	Firms which have a higher rate of sustainable growth have lower levels of systematic risk. This effect can be attributed to the financing aspect of the firms as they don't have to rely on debt to finance their investments.
3.2	The positive signs of coefficients and t-statistic of asset growth and sales growth points towards an increased level of risk with an increase in any of these growth measures. Assets in place are less risky than growth options; therefore growth option available to firms is liable to result in an enhanced level of systematic risk.
3.3	A positive impact of sales growth on firm betas can be attributed to the financing aspect of the firms. Since a given level of growth in sales requires investment in fixed assets in order to maintain that given level of sales growth, this may cause severe cash problems for the managers. Managers must consider this aspect while taking their financing decisions.
3.4	Test of causality provides evidence that firm betas are caused by factors like SGR, ASSETG and BE/ME. But no causality seems to exist in an examination of beta to cause variations in the said variables. Thus, there is one way causality between SGR, ASSETG & BE/ME and firm betas.

3.5	Impulse response of beta to SGR, ASSETG, sales growth and firm size is negligible in its magnitude. Shocks in book-to-market seem to impact firm betas and this impact diminishes over a period of one year.
3.6	It is notable that firm growth measures do not seem to exert a sizeable impact on the firm beta. The evidence from variance decomposition of betas propose that in a three lag variation of firm betas, 99.43 percent of variation has been caused by its own previous values, while growth measures under consideration *viz.* SGR, asset growth and sales growth cause 0.097, 0.166 and 0.054 percent of the variance in the betas respectively. Book-to-market ratio and firm size induce nominal impact on betas when considered as exogenous variables in regression **model 4**.

Appendix 3: List of publications

S.No.	Publication details
1.	**Journal publications**
1.1	Arora, L., Kumar, S., & Verma, P. (Forthcoming-2019). Is Growth Risky? Evidence from India. *Research in Finance*, *35*. (Included in Thomson Reuters Book Citation Index; Rank 'C' category journal in ABDC list of 2013 & 2016 and Indexed in Scopus). Details of indexing and abstracting can be checked at: http://www.emeraldgrouppublishing.com/products/books/series.htm?id=0196-3821
1.2	Arora, L., Kumar, S., & Verma, P. (2018). The Anatomy of Sustainable Growth Rate of Indian Manufacturing Firms. *Global Business Review*, *19*(4), 1050-1071. (Rank 'C' category journal in ABDC list of 2013 & 2016 and Indexed in Scopus). Details of indexing and abstracting can be checked at: https://in.sagepub.com/en-in/sas/global-business-review/journal200886#abstracting---indexing
1.3	Arora, L., Kumar, S., & Verma, P. (2018). Revisiting the Asset Pricing Paradigm using Sustainable Growth Rate. *International Journal of Economics and Business Research*, *16*(1), 46-62. (Rank 'C' category journal in ABDC list of 2013 & 2016 and Indexed in Scopus) Details of indexing and abstracting can be checked at: http://www.inderscience.com/jhome.php?jcode=ijebr#ranking
1.4	Arora, L., Kumar, S., & Verma, P. (2016). Growth Measures and Stock Returns. *Indian Journal of Finance*, *10*(11), 43-53. (Indexed in Scopus). Details of indexing and abstracting can be checked at: http://indianjournaloffinance.co.in/index.php/IJF/pages/view/ia
2.	**Conference papers**
2.1	Arora, L., Kumar, S., & Verma, P. (2017). Examining the Growth-Risk Relationship using Panel VAR Model. Paper selected for *The 12th International Conference on Asian Financial Markets and Economic Development.* (January 7th – 8th, 2017), Kyoto & Shiga, Japan.