The Most Appropriate Sustainable Growth Rate Model For Managers And Researchers

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ABSTRACT

The objectives of this paper are to analyze whether there is a significant difference among widely used Higgins model and Van Horne model and whether these two competing sustainable growth rate models (SGR) estimate divergences in ways that are systematically related to variations in common financial characteristics. We find that Higgins SGR when used as continuous and dichotomous variables is more affected by variations in financial characteristics than Van Horne's model. This study confirms that Higgins and Van Horne's models are qualitatively and approximately the same in relation to most common financial characteristics of a firm. However, if the Higgins model is used to compute SGR, it would give higher SGR for more profitable firms than Van Horne's. A firm with higher leverage is given higher SGR in Van Horne's than Higgins. Variations of liquidity, debt maturity and financial distress are trivial in economic sense. Finally, we find that the both Higgins and Van Horne's models result in approximately same (less than 4%) loss in sample size and not induce more sample-selection bias. We suggest that Higgins and Van Horne's models are equally preferable from both the managers' and researchers' point of view.

Keywords: Sustainable Growth Rate Model; Higgins Model; Van Horne's Model

INTRODUCTION

Many top managers tend to think that a higher growth rate is better. However, too much growth is bad for business. It causes financial stress to business such as significantly high costs, resulting financial losses, debt burden and can lead to crises such as a decline of market share and loss of talented employees or even bankruptcy. Growth is beneficial only up to a certain level. Beyond that level it is not healthy to the business. Sustainable growth can be identified as the ability to facilitate balance and sustainable expansion and it helps not only survival but also keeps competitiveness within the industry. Every company often establishes goals for sustainable growth and the pursuit of these goals can improve the financial condition of a firm or increase the financial distress of a firm and the pressure requires changes in operating and/or financial policies. This is a practically applicable concept in the modern financial management context which can be used in the strategic planning of a firm.

The management of a firm knows that rapid sales growth requires additional assets in the form of property plants and equipment, inventories and account receivable which require money for additional assets purchased for excess growth. They know that if the firm doesn't have sufficient funds when needed, it won't accelerate the firm's growth. The sustainable growth model shows these intuitive truths explicitly. The sustainable growth rate is a useful tool to a banker to determine the creditworthiness of a firm and there are several sophisticated software packages that are helpful for the purposes of analysis. The comparison of the actual growth rate to its sustainable growth rate indicates what issue will be on the agenda of the top management and management's problem may be where to get the cash for growth. Further, it helps a banker to understand why a loan applicant needs money and how long the need will continue. The sustainable growth rate models help the bankers for explain to financially inexperienced small and medium businessmen, why it is necessary to keep a proper balance between a firm's growth and profitability (Higgins, 2007). These practical implications highlight how SGR is important for today's business.

Further, SGR is applied in different research studies such as Martani, Mulyono and Khairurizka (2009) which examine the relevance value of accounting information in explaining stock return; Escalante, Turvey and Barry (2006) for farm level evidence on sustainable growth paradigm for grain and live stock farms; Cao (2005) for Evaluation of reliance on sustainable growth; Demirguc-Kunt and Maksimovic (1998) for investigating differences in legal and finance systems affect firm's use of external financing for fund growth; Jarvis, Mayo and Lane (1992) use a sustainable growth model to make a macro marketing decision; Vasiliou and Karkazis (2002) apply SGR model in the banking industry to assess the feasibility of its plans for growth; Hyytine and Pajarinen (2005) apply SGR model to study the relationship between firm level disclosure quality and availability of external finance to a firm; Geiger and Reyes (1997) use the SGR model for assisting small business owners to determine the appropriate rate of growth for the firm's given cost and debt level; Phillips, Anderson and Volker (2010) used a SGR model to analyze the cross-sectional variations of financial ratios among privately held retail companies at different growth cycle stages; Jin and Wu (2008) apply a SGR model to investigate the relationship between intellectual capital and sustainable growth ability; Pickett (2008) applies SGR model to identify the subtle relationship between marketing and operation efficiencies; Dhannapal and Ganesan (2010) use the SGR models to find out solutions related to profitability and effective use of leverage in Textile industry in India. These researchers (just to cite some) show the practical implications and importance of SGR to different kind of research.

Ashta (2008) pointed out that 41% of corporate finance books in Burgundry School of Business (France) include and discuss the sustainable growth rate and he stated that the concept was fairly useful. Firer (1995) examined 26 modern finance text books and found that 73% of text books discussed the sustainable growth rate models. It becomes clear from this research that sustainable growth rate is an important and useful concept in modern corporate finance studies.

According to the literature, there are several models formulated by different researchers. They point out that some of these models can be widely and commonly used irrespective of the firm's financial situations and other researchers explain the specific situations where their model can be used. Researchers such as Platte et al. (1995) – SGR model for financial distress; Hamman (1996) – cash flow SGR model; Jagers (2003) – SGR model for non-profit organizations; Escalante, Turvey and Barry (2009) – develop a sustainable growth challenge model for agricultural industry; have developed sustainable growth for specific situations and these SGR models based on or extend from the general SGR models of Higgins (1977) and/or Van Horne's (1987). This is a better indication of the importance of the study of general SGR models for academic and research purposes. Therefore, there may be significant levels of agreement and disagreement among different commonly used models. In this study, we use two widely and commonly used Higgins (1977) and Van Horne's (1987; 1998; 2007) SGR models. The main objective of this paper is to analyze whether there is a significant difference among these two models in terms of their SGR. A further objective is to analyze whether these two competing SGR estimates diverge in ways that they are systematically related to variations in common financial characteristics of a firm and make valuable suggestions for usage of these sustainable growth rate models in different financial situations of the firm.

According to the literature review, many researchers use different models and it is clear that they do not adequately explain why they use that particular model to measure a firm's sustainable growth. Ulrich and Arlow (1980) presents a SGR with full capacity assumption of assets turnover ratio and sales linked to opening assets and new assets are clearly demarcated. Further, new equity is also separated from the opening balance of equity and the debt ratio is computed based on the opening equity balance. Clark et al. (1985), Platt et al. (1995) use different models, but they do not adequately explain why they use them and obtain the same results. Ashta (2008) attempted a comparative analysis of two growth models which derived from Higgin's (1977; 1981) model and he concluded that sustainable growth rate models work consistently and there is no significant difference. However, he used a simple and "fictitious classroom kind of illustration" and his figures were also hypothetical. Therefore, it may be inadequate for broad scientific explanations. Ashta (2008) also points out that his paper is limited to suggesting a more reasonable way of using the sustainable growth rate framework for financial analysts, practitioners and educators as well as students. There are two generally and widely use sustainable growth models and there is no adequate comprehensive research on comparative analysis for divergence in their SGRs and their usage in different firm's situations. Firer (1995) offers a brief discussion on various SGR models that exist in the literature. However, he fails to explain any difference among the models and when and where (difference situations) managers can apply these models for the computation of a firm's SGR. Therefore, it is necessary to carry out a comprehensive study and findings of our research should respond to the following research questions.

From the perspective of mangers and business practitioners, they have a problem, which is the difference among these SGR models and where it can be applied to compute a firm's SGR. According to the researchers' point of view, we suggest that a researcher's choice of one model over the other should be dictated by several factors. Firstly, we find that when the SGR is measured by continuous variables and its relative level is significantly related to a wide array of commonly used financial characteristics. This may show that a wide array of commonly used financial factors affect significantly in a different manner in magnitude (value) of various SGR estimators. Secondly, the SGR defines as a dichotomous variable the firms which are classified as either above or below the SGR level of zero (positive or negative growth), regardless of other financial characteristics. This analysis may also show that wide arrays of commonly used financial factors have different affects on the direction of growth (positive and negative signs) of SGR models. Thirdly, researchers are concern as about the economic sense of SGR applicability. The broad research question of this paper is "Which Sustainable Growth Rate (SGR) estimator is better for managers and researchers and we test how a firm's common financial characteristics affects magnitude (value) and direction (sign) of the SGR which is measured by different SGR estimators.

The next sections of this paper are arranged in the following way. First, we will find when these two models are measured as continuous variables, how their relative levels are significantly related to a wide array of commonly used financial characteristics. Second, SGR is defined as dichotomous variables, the model SGR classifies firms similarly as either above or below the SGR level of zero (positive or negative growth) regardless of other financial characteristics. Here, we analyze how wide arrays of commonly used financial characteristics significantly affect the direction of growth (positive and negative signs) of different SGR models. Third, we will take the raw difference of two SGRs, is measured as a continuous variable, and how their relative levels are significantly related to a wide array of commonly used financial characteristics. These analyses explain what financial characteristics affect the different SGR models in different ways. Next, we examine the properties of the two SGR estimators when they are used as a means of classifying a firm along some quality characteristic (i.e. as a dichotomous variable) and we will also look at whether the results of Chi-squared tests are significant. The next section of the paper includes the results and discussion of theses analyses. In the final section, we draw conclusions and suggestions based on the research findings.

THEORETICAL FRAMEWORK

Sustainable Corporate Growth

Scholars have suggested that a company's maximum long-run growth rate is equal to the sustainable corporate growth. Huang and Liu (2009) point out that the financial idea of the sustainable growth means the actual growth of the firm must harmonized with the its resources and the quicker growth or slower growth induce the firm's financial or survival crises respectively. A Higher growth rate above the SGR rate can create many problems for a company and it is not healthy for the long-run of the company. It may overburden the companies due to the inability to manage and control as well as deteriorating their financing capabilities. The SGR is the threshold limit for corporate growth and it may indicate to the management where company will stop its growth or where they can increase the SGR (Raisch and VonKrogh, 2007).

The SGR is the maximum rate of growth in sales that can be achieved at the given profitability, asset utilization, desired dividend payment and financial leverage of the firm (Higgins, 1977). The sustainable growth rate is also defined as the maximum rate at which it can grow without changing its operating and financing policies. The SGR can be increased by improving its operating and financial performance. According to the Platti *et. al* (1995) sustainable growth is defined as the rate at which a company's sales and assets can grow if the company does not issue new equity and wish to maintain its capital structure. According to the theory of sustainable growth, SGR analysis identifies the target growth rate at which these pressures arise and this unrestrained growth leads to less than optimal performance and/or financial distress.

Higgins Sustainable Growth Model

The concept of sustainable growth was developed by Robert C. Higgins in 1977 for discrete time framework and it was extended by him for continuous time framework (Higgins, 1981). He developed the SGR

comprising of four accounting ratios namely: dividend payout, profit margin, assets turnover and capital structure. Higgins' sustainable growth rate formula is given by:

$$HSGR = ((RI/NPAT) * (NPBT/TO) * (TO/NA) * (NA/E)) \quad (1)$$

Where NPAT = Net Profit after tax; NPBT = Net Profit before tax; TO = Turnover (Sales); RI = Retained earnings; E = Book value of Equity; NA = Net Assets

According to the Higgins' Model (1977, 2001, 2007), the Model assumes that the company does not issue new equity capital and portion of retained earnings and debts invest in assets. This increased assets help to increase of sales; finally it enhances the profit of the company. This is a cycle within the firm. Higgins (1977) model can be used only for the discrete change framework[1]. Higgins' (1981) Model incorporates the continuous changes of a firm and obtains similar results as the previous model. Clark et al. (1985) carry out a study to illustrate the sustainable growth (HSGR) for strategic planning.

Van Horn's Sustainable Growth Model

Van Horne (1987) developed a sustainable growth model to measure a firm's sustainable growth. It comprises of four accounting ratios namely: net profit margin, asset turnover, retention rate of return and equity multiplier. This model comprises of sales performance, financing ability and dividend policy of the firm. Van Horne's sustainable growth equation is as follows:

$$VSGR = ((b\ (NPBT/TO) * (1+ D/E)) / ((A/S) – (b\ (NPBT/TO) * (1 + D/E))) \quad (2)$$

Where; D/E = Debt to Equity; A/S = Total Assets to Sales; b = Retention rate; NPBT= Net profit before tax; TO = Turnover (Sales)

Van Horne's (1987; 2007) SGR model is the quantitative description of the sustainable growth rate which is at variance with the sales income. Van Horne and Wachowicz (2008) explain that determinants of desired sales growth are constant with the realities of the firm and the financial market place. Dhannapal and Ganesan (2010) point out that Van Horne's SGR model is a powerful tool for checking consistency between sales growth goals, operating efficiency and financial objectives of a firm.

The Sustainable Growth Rate (SGR) is the maximum feasible growth rate of a firm and which can be achieved in accordance with their financial, operational, managerial conditions and policies. We selected HSGR and VSGR estimators for the computation of sustainable growth, because these two estimators are not related only to the particular conditions or situations of a specific firm and it has been widely used for measure SGR. Further, the main assumptions are the same for the two models. The two estimators (models) assume that there is no change in equity financing, steady state variables, earning retention and the debts play a vital role. They also assume changes in asset, retained earnings and debt. These two models can not apply to measure SGR, when firms issue new equity capital and it is common to the models.

RESEARCH METHOD

Population

All United State manufacturing companies found on the Compustat Industrial Research Database (namely SCI 2000-3990) and full coverage tapes from 2000 to 2008 are dealt with into this study. Van Horne's (2007) and Pickett (2008) point out that variables used in a SGR model are called "target variables" which are considered as accounting ratios. The calculated SGR provides snapshot of a company's financial situation. Target ratios are industry specific and more care must be taken not to compare the SGR of firms in different industries. Furthermore, macro economic factors such as inflation (Higgins 1981; Johnson; 1981; Blakley and Sti, 1989; Lewellen, and

Kracaw 1987) affect SGR and these effects on the firm can vary according to the type of industry. Considering the above facts, we limit our study to one industry (manufacturing industry) for this research.

Sample Formation

The foreign listed U.S. companies, foreign companies which were listed in U.S. stock markets and companies in which financial data was missing, were excluded from the sample of this study. Higgins and Van Horne's sustainable growth models assume that companies do not issue new equity capital and companies can use retained profit and debt capital for their sustainable growth. Therefore, companies which issued new equity capital were excluded from the sample. In total 15,377 companies were included in the sample.

Hypotheses Development

The two separate groups of hypotheses are shown in this section. The first section mentions the hypothesis for sustainable growth rates which are computed by Higgins and Van Horne's models. The second section of hypotheses are about two sustainable growth estimators which will diverge in patterns related to the wide array of commonly used financial characteristics.

Hypothesis 1: There is no significant difference between sustainable growth rate of the Higgins' model and Van Horne model.

Van Horne (1987) argues that growth management requires careful balancing of sales objectives with operating efficiency and financial resources. If a firm does not wish to change its equity structure, it must change one or more financial ratios to accommodate divergence of the firm's growth rate. We compare two sustainable growth rates of the same company in the same situation and the same period, computed using the SGR models. Divergence of two growth rates is due to how characteristics influence the models disparately. We also hypothesize; Hypothesis 2: Two sustainable growth estimators will diverge in patterns where they are systematically related to variations in the liquidity, profitability, leverage, debt structure, efficient working capital management, cash adequacy, effective capital investment, free cash-flow generating ability, tax rate and financial distress of the firm. We limit our analysis to a small set of ratios that serve as proxies for these characteristics defined in Table 1.

Table 1
Selected Financial and other firm's Characteristics Measurements

Variable	Measurement
Liquidity (X1)	Current Assets/Current Liabilities
Profitability (X2)	Return on Equity
Leverage (X3)	Interest Bearing Debt/Equity
Debt Structure (X4)	Value of Short-Term Debt/Value of Total Debt
Efficient Working Capital Management (X5)	Cash Conversation Cycle (log of CCC)
Cash Adequacy (X6)	(Cash Flow from Operation) /(Long-Term Debt Paid+ Fixed Asset Purchased + Cash Dividend Paid)
Firm Size (X7)	Total Assets (Log of Net Book Value)
Effective Capital Investment (X8)	Assets Turn Over Ratio
Free Cash-Flow Generating Ability (X9)	(PBID – (tax liability changes in deferred tax + interest + dividends)) / Value of total Assets
Tax Rate (X10)	Profit Tax / Pre-Tax Profit
Financial Distress (X11)	Altman Z Score

Note: PBID denotes for profit before interest and depreciation. Return on Equity is net profit after tax divided by equity, Cash Conversion Cycle (CCC) is an additive measure of the number of days funds are committed to inventory and receivables less the number of days payments are deferred to suppliers (Johnson and Soenen, 2003), Asset turnover ratio is total fixed assets divided by Sales turnover, Altman Z-Score is calculated by; $Z = 0.012\ X_{1a} + 0.014\ X_{2a} + 0.033\ X_{3a} + 0.006\ X_{4a} + 0.999\ X_{5a}$; where, X_{1a}= Working Capital/ Total Assets, X_{2a} = Retained earnings/ Total Assets, X_{3a}= Earnings Before Interest and Tax/ Total Assets, X_{4a} = Market Value of Equity/ Book Value of Total Debts, X_{5a} = Sales/ Total Assets, Z = Overall Index

Statistical Analysis

Higgins and Van Horne models are used to compute SGR by using appropriate formula. We compute two growth rates namely HSGR and VSGR for each sample firm from 2000 to 2008. A descriptive statistical technique is primarily used to identify whether these models have noticeable differences among Higgins and Van Horne's. The Wilcoxon test is used to analyze whether there is a significant difference between Higgins and Van Horne sustainable growth models.

Further, an ordinary least square (OLS) regression technique is used to ascertain which financial characteristics affect Higgins' and Van Horne's magnitude of SGRs and to ascertain reasons for their significant differences. Logistic regression is used to analyze which financial characteristics influence the direction of (negative or positive) SGR of two models. Another OLS regression is used to identify the divergence of two SGRs related to the commonly used financial characteristics. We use an extremely large sample size. Hence, the power of our test statistics shows that the statistical differences could not reflect economic sense. To verify the most significant statistical economic differences, we carry out another descriptive statistic analysis by comparisons of percentage differences of firms for each considered financial character respective to 2 groups of SGR models (HSGR and VSGR). We use Chi-squared tests to check whether the percentage of firm's differences for each considered financial character respective of the HSGR and VSGR models difference are statistically significant.

RESULTS AND DISCUSSION

Sample Characteristics

We use a measure of the value difference between two SGRs: D(HSGR- VGSR), defined as the raw difference between the Higgins sustainable growth rate and the Van Horne's sustainable growth.

Table 2 presents descriptive statistics for the two SGR estimators of un-winsorized and winsorized data, and for the two measures of the differences in SGR between them which are denoted as D(HSGR- VGSR), for both the overall sample and for 3 three-year samples. For the full sample, the means, HSGR and VSGR are -1.42 and 0.04 for un-winsorize groups respectively and it is highly skewed for HSGR. The mean values of winsorize groups for the two SGRs are -0.07 and 0.04 respectively and they are lowly skewed. Although the median values of SGR measures are closer than their respective means. The winsorize process minimizes the outlier effect which denotes the lowering of corresponding standard deviations of SGRs. The Wilcoxon tests reveal that both the mean values of all SGR models for un-winsorize and winsorize groups are statistically significantly different from zero. This reveals that the SGRs differences in the models do not occur due to the outliers effects. The mean values of HSGR and VSGR of un-winsorize group for the sub-samples (various periods: 2000-2002, 2003-2005 and 2006-2008) are ranged between -4.28 to 0.49 and, 0.01 to 0.07 respectively. The mean values for the same SGRs for winsorize groups for the sub-samples (various periods: 2000-2002, 2003-2005 and 2006-2008) are ranged between -0.12 to -0.04, and 0.03 to 0.04 respectively. Although, it is observed that the smaller values for the median than the corresponding mean and both un-winsorize and winsorize groups have the same range of median (HSGR= 0.04; VSGR = 0.06 to 0.08) SGR values. However, the median values are more approximate to each other than their respective mean values, the Wilcoxon test[2] reveals that the median values of SGRs are also significantly different from zero. All the mean values of both un-winsorize and winsorize for HSGR, and VSGR are statistically significant at 0.05 or below.

The difference between HSGR and VSGR is denoted by D(HSGR- VGSR), the mean is - 0.11 for the full sample. This measure is low skewed compared with their corresponding SGR value measures. The Wilcoxon tests reveal that the mean values of the difference sustainable growth rate (DSGR) model is statistically different from zero. Although the median values of the SGR measures are approximate to each other rather than to respective mean values, the Wilcoxon test reveals that the median values of all SGRs and DSGR are also statistically significant. In raw terms, the SGRs differ by less than 0.12. The mean levels of D(HSGR-VSGR) for the sub-samples (various periods: 2000-2002, 2003-2005 and 2006-2008) are ranged between -0.15 to -0.08. However, it is observed that median values for D(HSGR-VSGR) is smaller than corresponding mean value. The median value of DSGR is also statistically significant at 0.05 levels. All the mean values for D(HSGR-VSGR), is statistically significant at 0.05 or

below. A large number of firms' SGR could be calculated by using VSGR and HSGR models and there is no significant difference the application for number of firms. VSGR and HSGR models model results in approximately a less than 4% loss in sample size and it may not induce more sample selection bias[3]. Hence, in practical terms, VSGR and HSGR models can be applied to equal number of firms in selected sample.

Table 2
Descriptive Statistics for SGRs

Variable	N	Mean	Median	Min	Max	Std. Dev.
Overall						
HSGR	15377	-1.42	0.04	-13636.15	5909.10	130.83
VSGR	15377	0.04	0.07	-190.86	269.27	4.37
wHSGR	15377	-0.07	0.04	-1.67	0.81	0.53
wVSGR	15377	0.04	0.07	-0.52	0.50	0.25
D(HSGR- VGSR)	15377	-0.11	-0.05	-2.17	1.34	0.48
2000-2002						
HSGR	5655	-0.63	0.04	-2605.00	1338.00	44.21
VSGR	5655	0.07	0.06	-186.15	269.27	6.10
wHSGR	5655	-0.04	0.04	-1.10	0.70	0.40
wVSGR	5655	0.03	0.06	-0.54	0.55	0.27
D(HSGR- VGSR)	5655	-0.08	-0.05	-1.65	1.24	0.36
2003-2005						
HSGR	5013	-4.28	0.04	-13636.15	5909.10	228.36
VSGR	5013	0.01	0.07	-190.86	117.09	3.89
wHSGR	5013	-0.12	0.04	-2.64	1.05	0.75
wVSGR	5013	0.04	0.07	-0.48	0.46	0.23
D(HSGR- VGSR)	5013	-0.15	-0.04	-3.10	1.53	0.69
2006-2008						
HSGR	4609	0.49	0.04	-258.18	1507.13	30.76
VSGR	4609	0.02	0.08	-43.84	35.69	1.31
wHSGR	4609	-0.09	0.04	-1.83	0.80	0.57
wVSGR	4609	0.04	0.08	-0.53	0.50	0.25
D(HSGR- VGSR)	4609	-0.13	-0.05	-2.33	1.33	0.50

Note: This table presents summary statistics for the two SGRs for 2000-2008 and for three-year subsamples. The two Sustainable Growth Rates (SGR) are Higgins SGR (HSGR) and Van Horne's (VSGR). W denotes for winsorisze SGRs and, for an example; wHSGR is winsorize Higgins sustainable growth rate. D(HSGR- VGSR) defined as difference between Huggins and Van Hornes SGRs. The Wilcoxon tests reveal that both the mean and median values of all SGR models for un-winsorize and winsorize groups for overall sample are statistically different from zero. All the mean values of both un-winsorize and winsorize for HSGR, and VSGR are statistically significant at 0.05 or below. The mean values for D(HSGR-VSGR) is statistically significant at 0.05 or below. Missing N in overall sample are 603 and 540 firms for HSGR and VSGR respectively.

Table 3 and Table 4 present descriptive statistics for other variables (common financial characteristics). In Table 3, we depict statistics of HSGR, and VSGR for the firms. In contrast, Table 4 presents same statistics for the firms with negative and positive SGRs (HSGR, and VSGR) classification. Specially, it is observed that the number of SGR computed firms are almost same due to a minimum loss of firms in the sample. This low shrinkage of sample size associated would merely result in same power in regression analyses.

Table 3
Descriptive Statistics for Selected Firm Characteristics

Variable	Current	Return on Equity	Leverage	Debt Maturity	CCC	Cash Adequacy	Log Assets	Assets turnover	Free Cash	Tax rate	Z-score
Overall											
N	15134	15277	15236	15274	14392	14683	14989	15277	15062	15277	10927
Mean	3.05	-0.04	0.52	0.06	110.46	1.63	4.78	-0.09	2.68	0.16	2.21
Median	2.18	0.06	0.22	0.01	94.77	0.02	4.82	0.02	0.02	0.20	1.22
Std. Dev.	2.59	0.69	1.62	0.12	101.58	12.61	2.31	0.36	11.47	0.39	3.78
Min	0.29	-4.80	-4.82	0.00	-113.96	-35.49	-0.80	-1.69	-6.12	-1.58	0.03
Max	13.82	2.56	7.94	0.63	508.93	93..07	9.51	0.31	115.77	1.94	23.87
2000-2002											
N	5591	5655	5641	5655	5317	5434	5655	5655	5589	5655	4267
Mean	3.00	-0.63	0.61	0.07	116.59	0.99	4.89	-0.07	1.76	0.19	2.21
Median	2.07	0.04	0.29	0.02	98.54	0.03	4.94	0.01	0.03	0.28	1.25
Std. Dev.	2.80	0.44	1.93	0.13	108.31	11.11	2.23	0.25	7.84	0.27	3.61
Min	0.29	-2.60	-4.83	0.00	-99.11	-35.49	0.17	-1.01	-4.79	-0.74	0.14
Max	13.82	1.34	7.94	0.57	508.93	44.93	9.51	0.24	44.36	0.70	20.01
2003-2005											
N	4962	5013	5002	5012	4679	4765	4751	5013	4898	5013	3395
Mean	3.12	-0.09	0.43	0.06	108.19	1.35	4.62	-0.21	2.04	0.11	2.33
Median	2.26	0.07	0.18	0.01	93.49	0.03	4.62	0.02	0.02	0.05	1.22
Std. Dev.	2.59	1.09	1.71	0.13	99.31	11.52	2.39	0.85	8.93	1.34	4.31
Min	0.30	-4.80	-4.82	0.00	-133.93	-32.87	-0.80	-1.45	-4.81	-1.58	0.05
Max	12.31	2.56	6.28	0.63	434.03	51.40	9.41	0.31	49.69	1.94	23.87
2006-2008											
N	4581	4609	4593	4607	4396	4484	4583	4609	4575	4609	3265
Mean	3.05	0.00	0.49	0.06	105.82	3.26	4.80	-0.06	5.05	0.16	2.08
Median	2.25	0.07	0.19	0.01	90.81	0.01	4.85	0.03	0.01	0.19	1.19
Std. Dev.	2.41	0.53	1.19	0.11	98.08	18.11	2.30	0.28	20.59	0.28	3.50
Min	0.35	-1.76	-2.30	0.00	-113.96	-35.02	-0.47	-1.15	-6.12	-0.79	0.03
Max	11.34	1.49	5.17	0.56	419.14	93.07	9.13	0.31	115.77	0.77	20.01

Note: This tables shows the summary statistics for selected firm financial characteristics on sample of U.S. manufacturing firms found on the Compustat Industrial, Research, and full coverage tapes from 2000-2008 as overall sample and for three three-year subsamples. This includes samples firms have sufficient data available for calculate considered common financial characteristics.

Table 4
Descriptive Statistics for Selected Firm Characteristics in terms of Positive and Negative Two SGRs

Variable	Current	Return on Equity	Leverage	Debt Maturity	CCC	Cash Adequacy	Log Assets	Assets turnover	Free Cash	Tax rate	Z-score
Overall											
N	15134	15277	15236	15274	14392	14683	14989	15277	15062	15277	10927
Mean	3.049	-0.036	0.516	0.064	110.460	1.635	4.781	-0.092	2.676	0.160	2.206
Median	2.185	0.056	0.221	0.013	94.770	0.023	4.819	0.017	0.018	0.200	1.219
Std. Dev.	2.594	0.687	1.624	0.122	101.581	12.611	2.311	0.361	11.466	0.391	3.785
HSGR-											
N	6014	6053	6034	6053	5674	5814	6038	6053	5967	6053	4266
Mean	3.205	-0.385	0.538	0.071	104.892	1.696	4.384	-0.218	3.541	0.072	2.287
Median	2.153	-0.188	0.160	0.012	87.368	0.011	4.366	-0.097	0.009	0.000	1.167
Std. Dev.	2.893	0.747	1.719	0.131	110.029	14.280	2.216	0.374	13.330	0.429	4.046
HSGR+											
N	8623	8721	8699	8718	8275	8400	8721	8721	8611	8721	6392
Mean	2.945	0.210	0.520	0.058	114.790	1.564	5.097	0.010	2.030	0.225	2.126
Median	2.211	0.131	0.279	0.014	99.459	0.035	5.197	0.055	0.026	0.310	1.245
Std. Dev.	2.349	0.469	1.534	0.113	94.271	11.121	2.318	0.286	9.746	0.333	3.526
VSGR-											
N	4993	5019	5019	5019	4647	4752	4903	5019	4918	5019	3296
Mean	3.381	-0.278	0.099	0.083	96.696	1.883	4.051	-0.318	5.016	0.021	2.589
Median	2.187	-0.215	0.016	0.011	78.028	0.002	4.072	-0.168	0.003	0.000	1.181
Std. Dev.	3.179	0.848	1.799	0.151	122.561	16.675	2.213	0.446	16.155	0.335	4.599
VSGR+											
N	9702	9817	9817	9817	9337	9545	9654	9817	9710	9817	7398
Mean	2.858	0.096	0.752	0.055	116.688	1.474	5.157	0.031	1.475	0.240	1.972
Median	2.175	0.110	0.390	0.015	100.326	0.036	5.253	0.052	0.025	0.314	1.223
Std. Dev.	2.191	0.533	1.500	0.102	88.633	10.022	2.282	0.218	7.829	0.377	3.189

Note: This tables shows the summary statistics for selected firm financial characteristics on sample of U.S. manufacturing firms found on the Compustat Industrial, Research, and full coverage tapes from 2000-2008. HSGR is Higgins sustainable growth rate and VSGR is Van Horne's sustainable growth rate. This includes samples firms have sufficient data available for calculate two SGRs. + and – signs in SGRs denote positive and negative growth rates. For example $HSGR^-$ means negative Higgins SGR.

With compared to negative SGR firms, a large number of financial characteristics are associated with the firm's positive SGR. This indicates that the financial characteristics are highly associated with the direction of a firm's SGR. However, the SGR value differences are minimal in an economic sense, with most differences less than 5%.

The correlation metrics of two SGR models are presented in Table 5. The Spearman correlation was selected to examine the association among SGR models. This is because the Spearman correlation is less influenced by the outliers. Further, we also use winsorised SGRs, which minimize the outliers effect. The Spearman correlation between HSGR and VSGR for the entire sample is 53% and the correlations for subsamples are ranged from 44% to 60%. This reveals that the HSGR and VSGR are moderately related to each other.

Table 5
Correlations between SGRs Metrics

	HSGR	VSGR
HSGR		
Overall	1.00	
2000-2002	1.00	
2003-2005	1.00	
2006-2008	1.00	
VSGR		
Overall	0.53	1.00
2000-2002	0.60	1.00
2003-2005	0.44	1.00
2006-2008	0.52	1.00

Note: This table shows Spearman correlation among two SGR estimators. HSGR is Higgins sustainable growth rate, VSGR is Van Horne's sustainable growth rates. Statistics present both for overall sample and for three subsamples. All correlations are significant at the 1% level.

Test of SGR As A Continuous Variable

The results of the previous sections mostly confirm that the prior research findings of the two SGR models are divergent. However, there is a necessity to demonstrate which common financial characteristics affect magnitudes of SGR (values) of these two models. In this section, we extended the previous analysis by using following OLS regression:

$$HSGR = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} \quad (3)$$

$$VSGR = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} \quad (4)$$

To ensure the results are not driven by outliers, we winsorize all dependent and independent variables at the 0.02 level. Panel A of Table 7 presents the results of two regressions analysis[4]. The regression results show that the HSGR and VSGR models are consistent across models. The liquidity, profitability, capital investment, financial distress and rate of tax are significantly affected in all two models. The working capital management is significantly influenced by the magnitude (value) of VSGR. The magnitude (value) of VSGR is highly influenced by more common financial characteristics with moderate explanatory power. These results are consistent with those of previous findings which indicate the magnitudes (values) of the two SGR are associated with the wide array of commonly used financial characteristics[5] of a firm.

Table 6
Ordinary Least Square (OLS) Regression Results

Variables	Panel A		Panel B
	HSGR	VSGR	D(HSGR – VSGR)
	2000-2008	2000-2008	2000-2008
Constant	-3.84*	1.44*	-6.42*
	(0.013)	(0.007)	(0.013)
Liquidity	-0.09*	-1.02*	1.02*
	(0.000)	(0.000)	(0.000)
Profitability	44.22**	9.17*	33.79*
	(0.006)	(0.003)	(0.006)
Leverage	0.36	3.31*	-2.98*
	(0.002)	(0.001)	(0.003)
Debts Maturity	1.44	3.51	-2.34
	(0.035)	(0.018)	(0.037)
Working Capital Management	0.01	0.01*	0.01
	(0.000)	(0.000)	(0.000)
Cash adequacy	0.07*	-0.03	0.10*
	(0.000)	(0.000)	(0.000)
Firm Size (log assets)	-0.24	0.93*	-1.02*
	(0.002)	(0.001)	(0.002)
Capital Investment	43.32*	28.88*	11.57*
	(0.014)	(0.007)	(0.014)
Free Cash	-0.075	-0.108*	0.053
	(0.000)	(0.000)	(0.000)
Tax rate	8.61*	5.83*	3.19*
	(0.010)	(0.005)	(0.011)
Financial Distress	0.33*	0.33*	0.04
	(0.001)	(0.001)	(0.001)
R^2	0.491	0.377	0.287
Adj.R^2	0.49	0.376	0.286
N	9941	10119	9941
F-value	870.12	555.72	269.2
p-value	0.001	0.001	0.001
Durbin-Watson	1.942	1.824	1.935

Note: This table shows OLS regressions results of common financial factors affect two SGRs values and two SGR estimators diverge with variation in considered financial characteristics. HSGR is Higgins sustainable growth rate, VSGR is Van Horne's sustainable growth rate. Dependent variable of Panel A is either one of two SGRs and dependent variable of Panel B is difference among them. * denotes that significant at the .01 or below and ** for at the .05 level. All coefficients are multiplied by 100. Standard errors are in parentheses.

Tests of SGRs Divergences As A Continuous Variable

There is a need to demonstrate how the magnitudes (values) of these two SGRs diverge with the variation of common financial characteristics of a firm. In this section, we extend the previous section by using raw difference between SGRs of Higgins and Van Hornes SGRs and an OLS regressions models[6] are also used as follows:

$$D_{(HSGR\text{-}VSGR)} = \beta_0 + \beta 1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} \quad (5)$$

Where,

$D_{(HSGR\text{-}VSGR)}$ = SGR value difference between HSGR and VSGR model

Panel B of Table 6 presents the results of above regression analysis and it helps to interpret the divergences of SGRs in relation to the common financial characteristics of a firm. The coefficient of liquidity, profitability, leverage and capital investment and rate of tax are statistically significant in the models. We find that the level of

HSGR (relative to VSGR) is increasing in the liquidity, profitability, cash adequacy, capital investment and rate of tax, and decreasing in leverage and size of the firm. This explains that a more profitable firm with high liquidity and adequate cash which effectively invests in fixed assets is given higher SGR by Higgins model than Van Horne's model. Further, the firm which pays more tax also is also given higher SGR by Higgins model than Van Horne's model. However, a large firm with high leverage is given less SGR by Higgins than Van Horne's model. Taken as a whole, these results are consistent with those of previous sections and further indicate that the divergences in the levels of the two estimators are related with the variation in a wide array of commonly used financial characteristics[7].

SGRs As A Dichotomous Variable

The results of the previous sections mainly confirm prior research findings that the two SGR models diverge in relation to the variation in a wide array of commonly used financial characteristics. However, there is a necessity to demonstrate which common financial characteristics affect direction of growth (positive or negative sign) of the two SGR models. We define the dependent variable 1, if SGR is exceeding zero (positive growth) otherwise 0 (negative growth). In this section we extend the previous analysis by using following logistic regressions[8].

$$Z\ HSGR = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} \quad (6)$$

$$Z\ VSGR = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} \quad (7)$$

Where,

Z = direction (sign) of SGR (if positive 1, otherwise 0) of HSGR / VSGR models

The results of two estimates are presented in Table 7 and are consistent with the results in Panel A of Table 6. The logistic regression results show that the HSGR model is consistent with their respective OLS regression results for liquidity, profitability, rate of tax and financial distress. Further, these variables are highly influential on (higher coefficient) direction (sign) of HSGR than magnitude (value) of HSGR. It reveals that common financial characteristics have more impact on direction (sign) of growth rather than the magnitude (value). The firm size is statistically significant in logistic model of HSGR. It denotes that the direction (sign) of HSGR is influenced by the firm size rather than the magnitude (value) of HSGR. The liquidity, profitability, leverage, firm size, capital investment and rate of tax are significantly influential on the direction of SGR in VSGR model. However, there is no qualitative difference, the effects of common financial characteristics on direction (sign) and magnitude (value) of VSGR. This reveals that the VSGR model is consistently the same for both continuous and dichotomous variables in terms of considered common financial characteristics. The model explanatory (R square) power is highest in HSGR and is followed by VSGR. Further, there is no significant difference between HSGR and VSGR models in terms of R square.

Next, we examine the properties of two SGR estimators when used as a means of classifying firms alone some financial characteristics which were used as a dichotomous variables in previous analysis. We do an analysis which is roughly parallel to the previous section. We divide two SGRs into four sub-groups namely negative HSGR, positive HSGR and negative VSGR, positive VSGR. Then, we begin by partitioning firms based on the mean level of common financial characteristics considered in this study. We then examine whether negative HSGR and negative VSGR classify similar percentages of firms as, above and below the mean financial character of overall sample (cutoff point) in each subsample. The same procedure has been applied to the positive HSGR and positive VSGR. These results of the analysis are presented in Table 8 and they are consistent with those of previous section. Partitioning our data into individual value which is above or below the mean levels in the various financial characteristics, result in twenty two subsamples. In each of these subsamples, HSGR and VSGR differ from each other in the percentage classified as above and below the cutoff point (The cutoff point is the mean value of the particular financial character in the overall sample). Chi-squared tests[9] (equality of percentages) indicate that the percentage difference of firms for most financial characteristics between negative HSGR and negative VSGR group, and positive HSGR and positive VSGR group (for an example % difference of firm for the liquidity between

negative HSGR and negative VSGR, is 2.59%) are statistically significant in each case at the 0.001 level. However, the free cash-flow generating ability of a firm and financial distress are not statistically significant and firm size and cash adequacy are significant at the 0.01 level. We observe that although the differences are statistically significant, in many cases they are less than 5% in absolute terms. However, the leverage, profitability, cash adequacy, capital investment and rate of tax show a considerable high degree of differences and the leverage indicates the highest difference which is 39% in negative HSGR and VSGR group. The profitability and leverage indicated when more than 5% in positive HSGR and VSGR group. These findings also confirmed that the leverage, profitability, cash adequacy, capital investment and rate of tax have more influence on SGR value difference between HSGR and VSGR models. The result is consistent with the result of OLS regression of D(HSGR-VSGR).

Table 7
Logistic Regressions Results

Variable	Z HSGR	Z VSGR
Constant	8.40	60.31
	(0.09)	(0.08)
Liquidity	-5.04*	-12.64*
	(0.01)	(0.01)
Profitability	308.73*	92.23*
	(0.09)	(0.05)
Leverage	-1.81	30.63*
	(0.02)	(0.02)
Debt Maturity	25.61	-10.30
	(0.27)	(0.23)
Working capital Mgt.	0.02	0.09*
	(0.00)	(0.00)
Cash adequacy	0.23	0.02
	(0.002)	(0.002)
Firm Size (log Assets)	8.29*	9.04*
	(0.01)	(0.01)
Capital Investment	311.30*	433.48*
	(0.13)	(0.10)
Free Cash	0.91	-0.25
	(0.003)	(0.003)
Tax rate	66.21*	98.44*
	(0.07)	0.07
Financial distress	1.48*	0.07
	(-0.01)	(0.01)
N	9941	10119
Model Chi-square	390.83	362.93
p-value	0.0001	0.0001
Cox & Snell R^2	0.33	0.30
Nagelkerke R^2	0.44	0.42

Note: This table shows logistic regressions results of common financial factors affect direction (positive or negative growth signs) of two SGRs. Dependent variable define as either: Z HSGR defined as sign (if positive growth represent 1, otherwise 0) of Higgins sustainable growth model; Z VSGR defined as sign (if positive growth represent 1, otherwise 0) of Van Horne's sustainable growth model * denotes significant at the 0.01 level or below and ** denotes significant at the 0.05 level. All coefficients are multiplied by 100. Standard errors are in parentheses.

Taken as a whole, most financial characters are statistically significant in Chi-squared tests. Although statistically significant, these variations of current, debt maturity ratios and firm's financial distress are almost trivial in an economic sense.

Table 8
Classification Firms alone Direction (Sign) of HSGR and VSGR with Considered Financial Characteristics

	Firm characteristic value below sample Mean			**Firm characteristic value above sample Mean**		
	Negative Growth Rate			**Positive Growth Rate**		
Characteristic	HSGR	VSGR	DIFFERENCE	HSGR	VSGR	DIFFERENCE
Liquidity	65.51%	62.93%	2.59%***	31.23%	29.85%	1.38%***
	3940	3142		2693	2896	
Profitability	75.75%	74.56%	1.19%***	94.98	84.70	10.28%***
	4585	3742		8283	8316	
Leverage	40.32%	79.32%	-39.00%***	36.73	42.67	-5.94%***
	2433	3981		3195	4189	
Debt Maturity	72.87	71.37	1.50%***	23.16	22.76	0.40%***
	4411	3582		2019	2234	
Working capital Mgt.	61.31	64.36	-3.05%***	43.59	43.78	-0.19%***
	3479	2991		3607	4088	
Cash Adequacy	76.01	84.11	-8.11%**	21.26	20.46	0.80%**
	4419	3997		1786	1953	
Firm Size (log assets)	57.88	61.98	-4.10%**	56.95	57.59	-0.64%**
	3495	3039		4967	5560	
Capital investment	51.33	64.51	-13.18%***	91.39	93.07	-1.68%***
	3107	3238		7970	9137	
Free Cash	86.34	82.31	4.03%	7.91	6.54	1.37%
	5152	4048		681	635	
Tax rate	69.83	80.29	-10.46%***	69.11	69.72	-0.61%***
	4227	4030		6027	6844	
Financial distress	81.20%	78.37%	2.83%	16.68%	15.30%	1.38%
	3464	2583		1066	1132	

Note: This table presents result of sorting sample by several common firm characteristics. First, firms are classified into SGR type: positive and growth negative growth rate. Then, for each characteristic, the sample firm in the group is partitioned at its mean value. Based on SGR sign and below or above the mean characteristic value, we present the percentage, number of firm for HSGR and VSGR models. The percentage difference between HSGR and VSGR models is named as "DIFFERENCE". ***, **,* and + denotes statistical difference at 0.001, 0.01, 0.05 and 0.1 levels, between two group based on Chi-square test. HSGR is Higgins sustainable growth rate and VSGR is Van Horne's sustainable growth rates

Limitations and Future Research Directions

At least two limitations of this study need to be acknowledged, which lead to a number of future research questions. Firstly, this study considered only common financial characteristics which led to diverge of competing two SGR models. There are other factors such as general economic variables including inflation, foreign exchange, interest rates etc., economic cycles (expansion vs. recession), firm level capabilities, and quality of management's investment decision (Desai et al., 2003) which can affect growth rate/ SGR. These could be the source of other fruitful future research in same direction. Goddard et al. (2009) found that the country and industry effects are also two important sources for variation for growth rate of a firm. Our study sample is limited to the U.S manufacturing industry. Therefore, this study can be done in other contexts such as other industries and countries to identify contextual robustness.

CONCLUSION

In this paper, our purpose is to analyze the effect of commonly used financial characteristics on the magnitude (value) of two competing sustainable growth and their direction (signs) of SGRs. Further, we analyzed the extent to which two widely and commonly used estimators of Higgins (1977) and Van Horne (1987) SGR models, diverge in relation to common financial characteristics of a firm. The liquidity, profitability, capital investment, financial distress and rate of tax are significantly affected by the magnitude (value) of SGR in two models. Nine out of 11 common financial characteristics affect VSGR. Therefore, VSGR is highly influenced by more common financial characteristics than other HSGR. Further, our study reveals that considered common

financial characteristics have a higher degree of impact on the direction (sign) of growth than the magnitude (value/rate). The firm size and the free cash-flow generating ability are additional impacts on the direction (sign) of HSGR. There is no qualitative difference between common the financial characteristics influence on direction (sign) and magnitude (value) of VSGR and we found that VSGR gives consistently similar results as a continuous and dichotomous variable. Both OLS and logistic regression for HSGR and VSGR models have high and almost same range of explanatory powers. Spearman correlation results also depict that HSGR and VSGR estimators are related to each other. The test of the divergences reveals that a more profitable firm with adequate cash which invests in fixed assets and pays more tax is given higher SGR by Higgins model than by Van Horne's model. However, a large firm with high leverage is given less SGR by Higgins than Van Horne's model. Taken our economic analysis as a whole, variation of liquidity, debt maturity and financial distress are almost trivial in an economic sense, although they are statistically significant.

This study confirms that HSGR and VSGR are qualitatively and approximately the same in relation to most common financial characteristics of a firm. However, if the HSGR model is used to compute SGR, it would give higher SGR for more profitable firms than VSGR. On the other hand, if the VSGR model is used to measure SGR, a firm with higher leverage is given higher SGR than HSGR. HSGR and VSGR models result in approximately a same (less than 4%) loss in sample size and it may not induce more sample-selection bias. In practice, the selection of a model is at the discretion of the management between HSGR and VSGR and it depends on prevailing firm's financial and economic conditions in the business environment. If a management wants to be cautious, it is better to consider Van Horne's (VSGR) model. On the other hand, if management want to increase firm's growth in a slightly liberal manner, it is better to consider Higgins' (HSGR) model. From the researchers' point of view, if both continuous and dichotomous variables are used in the analysis, it is better to choose Van Horne's (VSGR) sustainable growth. The sustainable growth rate is a practically applicable concept in the modern financial management context which can be used as a strategic planning and controlling tool of a firm. Therefore, our results suggest that Higgins and Van Horne Models are equally preferable from both a managers' and researchers' point of view.

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REFERENCES

1. Ashta, A. (2008). Sustainable Growth Rates: Refining a Measure. *Strategic Change,* 17, 207-214.
2. Cao, Y. (2005). An Explanatory Study on Value Relevance of Sustainable Growth Rate: Evidences from Chinese and American Listed Companies. *Journal of Modern Accounting & Auditing*, 1 (5), 61-65.
3. Clark, J.G, Clark M.T. & Verzilli A.G. (1985). Strategic Planning and Sustainable Growth. *Columbia Journal of World Business,* 20 (3), 47-51.
4. Cochran, W.G. (1954). The Chi-Squared Test of Goodness of Fit. *Annuals of Mathematics and Statistics,* 23, 315-345.
5. Blakley, D.L. & Sti, A.D. (1989). Inflation and Firm Growth: A Reassessment. *Decision Economic and Finance*, 12 (1), 7-23.
6. Dhanapal, C. and Ganesan, G. (2010). Enterprise Sustainable Growth Rate Analysis: An Empirical Study. *International conference on Business and Economics,* 15-16, March 2010, Malaysia. http://www.globalresearch.com.my/proceeding/icber2010_proceeding/PAPER_242_EntrepriseSustainable.pdf
7. Demirguc-Kunt, A. & Maksimovic, V. (1988). Law, Finance and Firm Growth. *The Journal of Finance,* 53, 2107-2138.
8. Desai, A., Wright, P., Chuang, K.H. & Charoenwong, C. (2003). Impact of Changes in Strategic Investments on Shareholder Returns: The Role of Growth Opportunities, *Journal of Applied Business Research,* 19, 41-55.
9. Escalante, C.L., Turvey, C.G. & Barry, P.J. (2009). Firm Business Decision and the Sustainable Growth Challenge Paradigm. *Agricultural Finance Review,* 69, 228-247.
10. Escalante, C.L., Turvey, C.G. & Barry, P.J. (2006). Farm Level Evidence on Sustainable Growth Paradigm for Grain and Live Stock Farms. Proceeding of the International Association of Agricultural Economists Conference, Gold Coast, Australia, held on 12-18 of August 2006.
11. Firer, C. (1995). Investment Basics: Sustainable Growth Models. *Investment Analysis journal*, 41, 57-58
12. Geiger, J.J. & M.G. Reyes (1997). Debt Utilization and a Company's Sustainable Growth. 97sbi040 report,http://sbaer.uca.edu/research/sbida/1997/PDF/06.pdf, accessed on 5 October 2010.
13. Goddard, J., Tavakoli, M. & Wilson, J.O.S. (2009). Source of Variation Profitability and Growth. *Journal of Business Research*, 62: 495-508.
14. Higgins, R.C. (1977). How Much Growth Can a Firm Afford? *Financial Management,* 6 (3), 7-16.
15. Higgins, R.C. (1981). Sustainable Growth Under Inflation. *Financial Management,* 10 (4), 36-40.
16. Higgins, R.C. (2001, 2007). *Analysis of Financial Management.* (6th ed., 2001; 8th ed., 2007) Irwin-McGraw-Hill: New York.
17. Huang, R. & Liu, G. (2009). Study on the Enterprise Sustainable Growth Rate and Leverage Mechanism. *International Journal of Business and Management,* 4 (3), 200-212.
18. Hyytine, A. & Pajarinen, M. (2005). External Finance, Firm Growth and the Benefits of Information Discloser: Evidence from Finland. *European Journal of Law and Economics,* 19, 69-93.
19. Jarvis, L.P., Mayo, E.J. & Lane, P.M. (1992). Picking Winner: Solving an Industrial Policy Problem with a Sustainable Growth Model. *International Marketing review*, 9 (1), 19- 31
20. Jin, S. & Wu, Y. (2008). The Contribution of Intellectual Capital to Firm's Sustainable Growth Ability: An Empirical Investigation Based on Listed Companies in China. Proceeding of the International conference in information, innovation management and industrial engineering.
21. John, T.A. (1993). Accounting Measures of Corporate Liquidity, Leverage and Cost of Finance Distress. *Financial Management*, 22, 91-100.
22. Johnson, D.J. (1981). The Behavior of Financial Structure and Sustainable Growth in an Inflationary Environment. *Journal of Financial Management,* 10, 30-35.

23. Johnson R. & Soensen L. (2003). Indicatiors of successful companies. *European Management Journal*, 27(3), 364-369.
24. Lewellen, W. and Kracaw, W. (1987). Inflation, Corporate Growth and Corporate Leverage. *Financial Management*, 16, 29-36.
25. Martani, D., Mulyono & Khairurizka, R. (2009). The Effect of Financial Ratios, Firm Size and Cash Flow from Operating Activities Interim Report to the Stock return. *Chinese Business Review*, 8 (6), 44-55.
26. Pickett, M.C. (2008). Sustainable Growth Modeling: A Longitudinal Analysis of Harley-Davidson Inc., *ASBBS e-journal*, 4 (1), 171-176.
27. Phillips, M., Anderson, S. & Volker, J. (2010). Understand Small Private Retail firm Growth Using the Sustainable Growth Model. *Journal of Finance and Accountancy*, 3, 1-11.
28. Platt, H.D., Platt, M.B. & Chen G. (1995). Sustainable Growth Rate in Financial Distress. *Journal of Economics and Finance*, 19 (2), 147-151.
29. Raisch, S. & VonKrogh, G. (2007), Navigating a Path to Smart Growth. *MIT Sloan Management Review*, 48 (3), 65-72.
30. Saeed, A. (2009). Formality of Financial Resources and Firm Growth: Empirical Evidence from Brazilian SMEs 1999-2005. *Journal of Academic Research in Economics*, 1 (2), 131-144.
31. Ulrich, T.A. & Arlow, P. (1980). The Financial Implications of Growth. *Journal of Small Business Management*, 18 (4), 28-33.
32. Van Horne J.C. (1998, 2007). *Financial Management Policy*. (1st ed., 1998; 11th ed., 2007) Prentice-Hall: London.
33. Van Horne, J. & Wachowicz, J. (2008). *Fundamentals of financial management*, (11th ed., 2007), Prentice-Hall Publication.
34. Van Horne, J.C. (1987). Sustainable growth modeling. *Journal of Corporate Finance*, 2 (3), 19-26.
35. Vasiliou, D. & Karkazis, J. (2002). The Sustainable Growth Model in Banking: An Application to National Bank of Greece. *Managerial Finance*, 28, 20-26.

Notes:

[1] Higgins (1997) distinguishes between beginning of the sales and new sales. New sales link to the new assets. It assumes that beginning of the sales is sales at last year's level. However, Ashta (2008) points out that separating the sales of the last month of last year from the average sales of last year is difficult and this is not possible by using published annual financial statements.

[2]As a robustness check, we apply Wilcoxcon test for overall sample, three subsamples, un-winsorise, winsorise, and value difference among SGR models. In all cases, results were qualitatively unchanged.

[3]There are 15377 firms in the sample and losses of samples size are 3.92% and 3.52% for HSGR, and VSGR models respectively.

[4] We compute the variance of inflation factor for all independent variables. All variance inflation factors for all two models are below 1.5. Hence, there is no multicollinearity problem (Appendix 1). Further, the Durbin-Watson value is less than 2.0 which indicates that there is no auto/serial-correlation problem in the models. White's test confirms that there is no strong heteroscedasticity problem. The 0.05 significant levels are considered as cut-off significant level. Debt maturity in VSGR model is significant at the 0.1 level.

[5]As a robustness check, we apply the same regression analysis to three-subsamples. Three regressions results for HSGR models give same results for large coefficient financial characteristics. VSGR model's regressions results are almost same for overall sample and three-subsamples.

[6]We compute the variance of inflation factor for all independent variables. All variance inflation factors for all models below 1.5. Hence, there is no multicollinearity problem (Appendix1). Further, Durbin-Watson value is less than 2.0 which indicates that there is no auto/serial-correlation problem in the models. White's test confirms that there is no strong heteroscedasticity problem.

[7]As a robustness check, we apply same regression analysis to three-subsamples. The regression results for HSGR, and VSGR models give almost same results for overall sample and three-subsamples.

[8]Logistic regression describes the relationships between independent variables and a binary response variable which has only two possible values either 1 or 0. Logistic function is $f(Z) = e^z / (e^z + 1)$ and z measure overall contribution of all independent variables. We draw two logistic curves for HSGR and VSGR respectively and the diagrams are shown in the appendix 2. Logistic curve helps to interpret the model fit for the linear relationship. All two curves are sigmoid shapes which denote data sets are fitted to logistic model. In fact, there is no significant difference in the

shape of two curves and VSGR curve is most balanced curve and followed by HSGR curve.

[9] Because of the large sample size used in our study, small differences in percentages between subsamples will result of statistical significance in Chi-square test. Cochran (1954) explains for an exposition on the power of Chi-square test in large samples

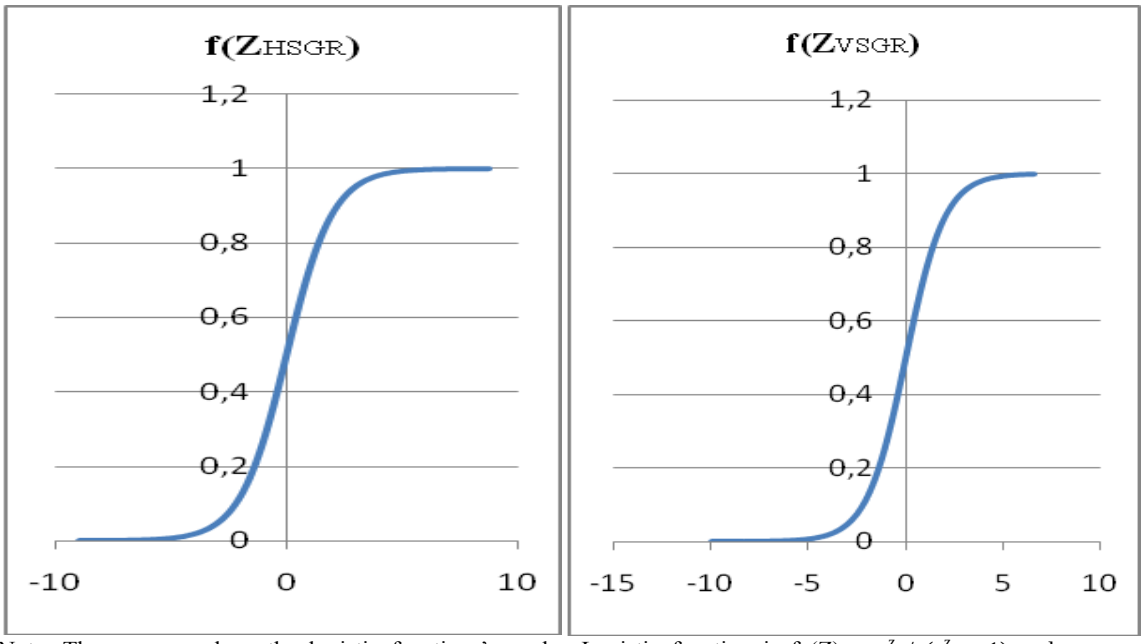
APPENDICES

APPENDIX 1
Multicolinearity test results

Variables	VIF(HSGR)	VIF (VSGR)	VIF(HSGR-VSGR)
Liquidity	1.25	1.25	1.25
Profitability	1.16	1.16	1.16
Leverage	1.08	1.08	1.08
Debts Maturity	1.38	1.38	1.38
Working Capital Mgt.	1.08	1.08	1.08
Cash adequacy	1.08	1.08	1.08
Firm Size (log assets)	1.14	1.13	1.13
Capital Investment	1.45	1.45	1.45
Free Cash	1.30	1.30	1.30
Tax rate	1.06	1.06	1.06
Financial Distress	1.19	1.19	1.19

Note: This tables shows the summary multicolinearity test results for selected firm financial characteristics on sample of U.S. manufacturing firms found on the Compustat Industrial, Research, and full coverage tapes from 2000-2008 as overall sample. HSGR is Higgins sustainable growth rate and VSGR is Van Horne's sustainable growth rates All Variance Inflation Factors (VIF) indicate that multicolinearity is not problem in all Ordinary Leas- square (OLS) regressions.

APPENDIX 2
Logistic Curves



Note: These curves show the logistic functions' graphs. Logistic function is f (Z) = e^z / (e^z + 1) and z measure overall contribution of all independent variables. The f(Z) represents the probability of outcomes with given sets of independent variables. Z is in horizontal axis and f (Z) is in vertical axis. Two curves are sigmoid shapes which denote data sets are fitted to logistic model. HSGR is Higgins sustainable growth rate and VSGR is Van Horne's sustainable growth rate.

