What Explains Superior Retail Performance?

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October 1999

Working Paper – Department of Operations and Information Management, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104-6366.

Abstract

We analyze the performance of retail firms for the period 1978-97 using public financial data. Our performance measures are long-term stock returns and whether the firm filed for bankruptcy in the period of study. We assume that over a long time period of at least five years, stock returns are a reasonable measure of the overall success of a firm.

We have found a very wide disparity in performance between firms. On the one hand, retailers like Wal-Mart, the Gap and Circuit City have had phenomenal success (nineteen year compounded stock returns of 31.2%, 29.5%, and 34.5%, respectively), while on the other, 17% of the public retail firms filed for bankruptcy. We investigate how the following levers managed by the CEO of a retail firm affect performance: return on assets, sales growth, inventory turns, gross margin, financial leverage, and selling, general, and administrative expenses. The nature of the analysis is contemporaneous, providing insights into managerial actions that correlate with success as measured by stock returns, but not a prediction of future stock returns.

We find that (1) return on assets, sales growth, standard deviation of return on assets and financial leverage explain more than 50% of the variation in stock returns for periods of ten years or more; (2) retailers in different segments–apparel, department stores, grocery and convenience stores, drugs and pharmaceuticals, jewelry, consumer electronics, home furnishings, toys, and variety stores–achieve similar return on assets and return on equity by following very different strategies with respect to their gross margins and inventory turns; (3) even within the same segment, high gross margin correlates with low inventory turns, and with high selling, general, and administrative expenses; (4) risk of bankruptcy is related to the mismatch between how fast a firm attempts to grow versus what growth rate it realizes. We also test for a negative correlation between sales growth and return on assets, which is widely believed to be true but is not borne out by our data.

1. Introduction

We analyze the performance of retail firms for the period 1978-97 using public financial data. Our performance measures are long-term stock returns and whether the firm filed for bankruptcy in the period of study. We assume that over a long time period of at least five years, stock returns are a reasonable measure of the overall success of a firm; the nature of the analysis is contemporaneous, providing insights into managerial actions that correlate with success as measured by stock returns, but not a prediction of future stock returns. We investigate how the following levers managed by the CEO affect success: return on assets, sales growth, inventory turns, gross margin, financial leverage, and selling, general, and administrative expenses.

Figure 1a shows a histogram of the compounded annualized stock returns of 293 public-listed retailers from December 1978 to December 1997 (nineteen years). Our data are drawn from Compustat and CRSP databases.[1] Notice that there is a very wide disparity in the stock returns of companies. There are tremendous successes like Wal-Mart, Gap Inc., and Circuit City Stores Inc. and dismal failures as evinced by the high rate of bankruptcy. If you had invested $1,000 in Wal-Mart stock at the close of trading on December 31, 1978, it would have grown to $173,000 by the end of December 31, 1997. A similar amount invested in Gap would have grown to $136,000, and in Circuit City, to $278,000. On the other hand, if you invested equally in all public retail firms in December 1978, about 17% of the firms you invested in would have filed for bankruptcy before December 1997.

Figure 1b shows the histogram of average stock returns of firms in the S&P 500 index on December 31, 1978 over the period 1978 to 1997. Comparing this with figure 1a, we observe that retail firms have a much higher variation in their overall success than the S&P 500 firms. Retailing is, thus, an excellent "laboratory" to measure the values of various managerial strategies. Our methodology and many of the results can be applied to other industries like distribution and manufacturing. However, the insights obtained may be limited if accounting statements do not adequately capture the key performance variables in some industry. Examples

[1] Our data set contains 346 firms, of which, we included all those firms that had stock return data for at least two years in this analysis. All returns were adjusted for dividends and stock-splits. For firms that had been publicly traded for less than nineteen years, we computed the returns based on the data available. For example, for a firm that had been public from 1985 to 1994, we computed returns over this period only.

include labor productivity in automobile manufacturing and intellectual assets in software development.

The wide disparity in retail performance begets several questions. We motivate them with an example of four contrasting companies in consumer electronics retailing. Figure 2 shows the annual sales, return on assets, inventory turns, gross margin and stock price appreciation for Best Buy Inc., Circuit City Stores Inc., Good Guys Inc., and Tandy Corporation.[2] The graphs show systematic differences between the retailers. Best Buy consistently achieved the highest sales growth, the lowest return on assets, and the lowest gross margin. Tandy consistently had the highest gross margin and the lowest inventory turns. Good Guys was comparable in sales volume to Best Buy in 1978 but achieved lower sales growth, higher return on assets, and the highest inventory turns in almost every period. Circuit City had the most consistent performance on all dimensions and the second highest return on assets. Given that each retailer was dominant on some measure of performance, it is not obvious from these comparisons which firm was more successful or how much impact sales growth and return on assets had on overall success. By analyzing these and other questions in this paper, we demonstrate the usefulness of the information contained in public financial data and provide insights into managerial actions that correlate with success as measured by stock returns.

Our main findings are as follows:

1. Firms with high average return on assets, high sales growth, and low standard deviation of return on assets achieved higher long-term stock returns.
2. The values of return on assets, sales growth, and return on equity do not vary significantly from one retail segment to another (e.g., apparel, grocery, department stores, etc.) implying that no one segment has yielded consistently higher returns over the period 1978 to 1997.
3. However, the components of return on assets vary considerably between retail segments. As expected, grocery firms have high inventory turns and low gross margins, while jewelry firms have high gross margins and low inventory turns. Given (2) above, it is not surprising that these differences are mostly of a compensating nature.

[2] Tandy Corporation owns the Radio Shack chain of stores.

4. The components of return on assets exhibit systematic tradeoffs even within the same segment. Firms with high gross margin have low inventory turns. Firms with high gross margin also spend more on selling, general and administrative expenses (SGA). However, contrary to our expectations, firms with high return on assets have high sales growth rates, though the extent of association is stronger for long time periods than for one or two year periods.
5. Firms that filed for bankruptcy had a much wider gap between their targeted growth rates and realized growth rates in the years before bankruptcy than the other firms. As a result, their asset productivity declined faster than that of healthy firms.

The paper is organized as follows. Section 2 gives a review of the relevant literature. Section 3 provides definitions of the performance levers obtained from public financial data and describes hypotheses for the following: for measuring the association between the management levers and firm success in section 3.1; for studying the relationships between gross margin and inventory turns, gross margin and SG&A expenses, and return on assets and sales growth in section 3.2; and for constructing a relationship between risk of bankruptcy and sales growth rate in section 3.3. Section 4 describes the data used in the study. Lastly, sections 5 and 6 present our results and discuss their interpretation.

2. Literature Review

2.1 Operations Management and Historical Perspective

The significance of high inventory turns was recognized by retail firms as early as in 1870s. The watchword in Marshall Field's department store at that time used to be that "any surplus in Field's is not stock, it is cash.[3]" Even today, retailers fix guide rules on "acceptable" gross margin, sell-through percentage, promotional expenses, new store openings, etc. based on similar watchwords. There is little, if any, research to explain how much impact superior management of these variables has on the overall success—achieving high stock returns with a low risk of going bankrupt.

[3] "Nineteenth Century Retailing and the Rise of the Department Store," Harvard Business School Case No. 9-384-022, 1983.

The growth of a retail firm is conceptualized in a framework called the "wheel of retailing." The wheel represents phases through which some types of retailers pass. A retailer penetrates the market on the basis of low price. Over time, it trades up to more expensive merchandise, services, locations, etc., thereby, opening a niche for new low-price retailers. The wheel of retailing and other theories of retail lifecycle, described by Levy and Weitz (1995), have been accepted for a long time and but their implications on retailers' performance have not been tested empirically.

Levy and Weitz (1995) describe a model, called the strategic profit model, to analyze the interrelationships between management levers of a retail firm. The model proposes that different firms may achieve similar return on equity by following different paths: the profit path, or the turnover path. The profit path is one with high gross margins and low inventory turns, while the turnover path has high inventory turns and low gross margins. Using this classification, the model provides a framework for the strategic analysis of retail firms. Our paper rigorously tests the interrelationships implied by this model and estimates their tradeoff curves, which can then be used to compare performance across retailers.

2.2 Financial accounting: Study of association between stock returns and accounting earnings

The association between stock prices and accounting earnings has been studied in academic literature in two contexts: whether earnings reports provide timely and useful information to the stock market, and whether earnings levels correlate with stock returns over long time periods. Seminal work in the first context was done by Ball and Brown (1968) and Beaver (1968a) and a considerable wealth of literature in financial accounting has added to that. Key issues in this research are how to measure the information content of earnings reports, which is called unexpected earnings, and what is the length of time period over which earnings information disseminates to investors. Baruch Lev (1989) provides an excellent review of the research in this area. Some older reviews can be found in Foster (1984), Lev (1974), and Watts and Zimmerman (1986). In all these studies, the correlation between unexpected earnings and stock price movement has been found to be very modest, rarely exceeding 10 per cent.

Research in the second context, investigating correlation between earnings and stock returns over long time periods, is relatively recent and methodologically closer to our analysis. Easton, Harris and Ohlson (1992) showed that the association between stock returns and total earnings scaled by market capitalization increases as the length of time period increases. They obtained R^2 values of 15% for 2 year periods, 20-30% for 5 year periods and 63% for a 10 year period.

The management levers used in our study are derived from accounting statements. They include sales growth and various components of return on equity: return on assets, financial leverage, gross margin, inventory turns, and selling, general, and administrative expenses. Prior research in accounting has not addressed the correlation between these variables and long-term stock returns to our knowledge. Our methodology and econometric models are similar to those of Easton, Harris and Ohlson.

2.3 Research on bankruptcy

The other area of research in accounting relevant to this paper pertains to bankruptcy. There are many models in literature for the prediction of bankruptcy (also called financial distress or corporate failure). The models can be classified as univariate and multivariate. Univariate models focus on the selection of the best variable for predicting bankruptcy from the leverage, liquidity and profitability ratios obtained from financial statements, and multivariate models combine several financial variables into a single discriminant function. Pioneering work in univariate models was done by Beaver (1966). He conducted a comparison of mean financial ratios of a paired sample of bankrupt and non-bankrupt firms for 1 to 5 years before the actual occurrence of bankruptcy. This analysis is called profile analysis. Some of the ratios used were cash flow/debt, net income/total assets, total debt/total assets, working capital/total assets, etc. Altman (1968), in a seminal paper on multivariate models, used multiple discriminant analysis to construct a linear function of five financial ratios that best distinguished between bankrupt and non-bankrupt firms. Ohlson (1980) used logit analysis to compute the probability of a company going bankrupt as a function of its financial ratios. Other predictive models of bankruptcy are presented in Beaver (1968b), and in Beaver (1968c). Zmijewski (1983) compares the univariate and multivariate models used in the studies before 1983 using a common statistical technique, a common definition of bankruptcy, and a common sample.

Economic theory has played a small role in the development of univariate or multivariate distress prediction models. Baruch Lev (1974) notes thus: "Attempts to construct a theory of corporate failure, that is, to identify and generalize the major causes of failure, have been meager and generally unsatisfactory because of the complexity and diversity of business operations, the lack of a well-defined economic theory of the firm under uncertainty, and a surprising reluctance by many researchers to incorporate the failure phenomenon in their models". Two attempts in this respect are by Wilcox (1971 and 1973) and Vinso (1979). Both these papers used gambler's ruin model to represent a firm and computed its probability of going bankrupt. These models have not been used in empirical research. Scott (1981) presents a review of theoretical and empirical research in bankruptcy with a view to reconciling the results of these two streams.

Our approach to analyzing bankruptcy differs considerably from existing research. The data samples used in all existing research have spanned several industries, which in our view, has made it difficult to identify causes of bankruptcy since they may vary from one industry to another. We focus on one industry, retailing, and attempt to formulate reasons why retail firms go bankrupt based on an understanding of their business operations. We find evidence that the risk of bankruptcy of a retail firm is related to the mismatch between how fast it attempts to grow and how much of that growth it is able to realize. This result is consistent with the existing research since not being able to realize a targeted growth rate can lead to a liquidity crisis in a retail company due to declining asset productivity and leftover inventory. We are currently testing a predictive model of bankruptcy using growth as the explanatory variable.

3. Models and Hypotheses Formulation

Appendix 1 contains the notation for all the variables used in this paper. For each variable, the subscript t = 0,…,T denotes the year of the financial statement, and i denotes the company. For instance, S_{it} represents the sales *during* year t and Inv_{it} represents the inventory *at the end of* year t. Using these income statement and balance sheet figures, we compute the following performance levers: return on assets, return on equity, sales growth, financial leverage, gross margin, inventory turns, total asset turns, gross margin return on inventory investment, and selling, general and administrative expenses as a fraction of sales. Their mathematical definitions used in the paper are shown in appendix 2; the subscript i is omitted for clarity.

3.1 Association between stock returns and management levers

We estimate the impact of return on assets, standard deviation of return on assets, sales growth, gross margin return on inventory investment, and financial leverage on firm success using cross-sectional regression models as described in this section. Firm success is measured by long-term (five years or more) stock returns. In shorter periods, movements in stock prices may occur due to external factors, and may not reflect fundamental changes in the performance of a firm. However, over long time periods, we assume that stock markets are efficient and reflect the true value of a firm.

The explanatory variables were identified by studying examples of some retail firms. We started with a larger set of levers including gross margin, inventory turns, and selling, general, and administrative expenses, besides the variables listed above. We observed that each of these levers had limited ability to explain success because firms that performed well on one lever may not perform well on the others. For example, in figure 2, Tandy has the highest gross margin but the lowest inventory turns. Return on assets and gross margin return on inventory are aggregate levers, incorporating the impact of more than one component, and hence, we use these to correlate with stock returns. We analyze standard deviation of return on assets also because we view it as another lever controlled by the management. Comparing Circuit City and Good Guys in figure 2, we observe that they have very similar average return on assets, but Circuit City shows a more consistent performance than Good Guys. The interrelationships between different components of return on assets are examined in section 3.2.

The models used for estimation are as follows. These models are tested with data for all retail firms that did not file for bankruptcy during the period of study. Each model is estimated for different time periods of length 5, 10, 15, and 19 years. For each period, we include all firms that have complete data available during that time, and exclude the others.

$$R_i = ß_0^1 + ß_1^1 RoA_i + ß_2^1 g_i + ß_3^1 (s_{RoA})_i + ß_4^1 DE_i + e_i^1 \quad (1)$$

$$R_i = ß_0^2 + ß_1^2 RoE_i + ß_2^2 g_i + e_i^2 \quad (2)$$

$$R_i = ß_0^3 + ß_1^3 ?GMRoII_i + ß_2^3 g_i + ß_3^3 DE_i + e_i^3 \quad (3)$$

$$R_i = ß_0^4 + ß_1^4 (GM\$_i / P_{i0}) + ß_2^4 (SGA\$_i / P_{i0}) + ß_{3s}^4 (Inv_i / P_{i0}) + e_i^4 \quad (4)$$

$$R_i = ß_0^5 + ß_1^5 (GM\$_i / P_{i0}) + ß_2^5 (SGA\$_i / P_{i0}) + ß_{3s}^5 (TA_i / P_{i0}) + e_i^5 \quad (5)$$

Here, R_i denotes average stock returns over a given time period for firm i, RoA_i, the average return on assets, g_i, the average sales growth rate, DE_i, the ratio of long-term debt to equity (financial leverage), σ_{RoA}, the standard deviation of return on assets, RoE_i, the average return on equity, $\Delta GMRoII_i$, the standardized gross margin return on inventory (explained below), $GM\$_i$

the total gross margin in dollars per share earned by firm i over the entire time period, $SGA\$_i$ the total selling, general and administrative expenses in dollars per share incurred by firm i over the entire time period, Inv_i the sum of annual closing inventory in dollars per share for firm i over the entire time period, TA_i the sum of annual closing total assets in dollars per share for firm i over the entire time period, and P_{i0} the share price for firm i at the beginning of the time period. Since we intend to compare success across companies, all five models are cross-sectional. That is, there is one data point per firm over the period of analysis, and the model fits a least squared error equation across firms and not over time for the same firm. Equation (2) uses return on equity in place of its components return on assets, financial leverage, and GMRoII in order to provide a benchmark for equations (1) and (3) since net earnings and return on equity (ratio of net earnings to book value of total assets) have been more commonly studied in academic literature than their components. Equations (4) and (5) use dollar amounts as alternative management levers instead of ratio measures. All these values are scaled by number of shares and share price to correct for size differences. The coefficients of inventory and total assets represent the cost of investment as perceived by investors. The index s on the coefficients indicates that we estimate different coefficients for each retail segment because inventory turns and asset turns vary significantly from one retail segment to another as explained below.

Standardized GMRoII, $\Delta GMRoII_i$, is defined as the standardized deviation of GMRoII of firm i from its retail segment. Mathematically,

$$\Delta GMROII_i = \frac{GMROII_i - GMROII^s}{s(GMROII^s)} \quad (6)$$

Here, $GMRoII_i$ denotes the average GMRoII for firm i over some time period, $GMRoII^s$ denotes the average GMRoII for retail segment s over the same time period and $\sigma(GMRoII^s)$ denotes the standard error of GMRoII for segment s. We cannot do a regression of stock returns directly with GMRoII because, unlike the variables in equations (1) and (2), GMRoII varies systematically from one retail segment to another. Table 1 shows the results of ANOVA tests for the variation in the values of performance levers between the following retail segments: apparel, department stores, grocery and convenience stores, drugs and pharmaceuticals, jewelry, consumer electronics, home furnishings, toys, and variety stores. We observe from the F-statistics that RoA, RoE and sales growth do not have significant between-segment variation. For financial leverage, while the F-statistic is significant, pair-wise tests for differences between the financial leverage of any two retail segments are not statistically significant. Thus, we think that financial leverage also does not vary systematically between segments, and the significance of the F-statistic comes from the large number of degrees of freedom. The results in this table are not unexpected because:

1. Assuming limited entry- and exit- barriers in each retail segment, return on equity should not vary from one segment to another over long time periods. Segments with higher RoE would attract competitors until their returns were equalized. Similarly, segments with low RoE would see some companies exit the segment, leaving the remaining companies with higher RoE.
2. Financial leverage is entirely under the control of managers. So we do not expect it to vary between segments.
3. Since RoA can be derived from RoE and financial leverage, it too should not vary from one segment to another if RoE and financial leverage do not vary.
4. Lastly, sales growth is also determined by the management of a company. We expect that a high growth retail segment would see many new entries so that its growth rate will slow down over a long time period, while a low growth retail segment would see more consolidation activity boosting its growth rate. Thus we do not expect growth rates to be higher for one segment than for another over long time periods.

GMRoII, however, has very large differences between retail segments. For example, grocery chains have average GMRoII of 393% while apparel chains have GMRoII of 240%. To understand these differences, we break RoA into its components as follows:

$$\begin{aligned} \text{RoA} &= [\text{GM} - \text{SGA}]/\text{Assets} \\ &= [\text{GM/Inventory}] \times [\text{Inventory/Assets}] \times [\text{GM} - \text{SGA}]/\text{GM} \\ &= \text{GMRoII} \times \text{Inventory Intensity} \times \text{SGA Intensity} \end{aligned} \tag{7}$$

We find that the differences in the values of the components of RoA between segments are of a compensating nature. Grocery retail firms have a higher GMRoII compared to apparel retailers but their ‘inventory intensity’ is much lower at 25% compared to apparel retailers, for which it is about 33%. Thus, different segments have similar expected return on assets in spite of very strong systematic differences between the values of the components of return on assets. The table shows average values in each segment for four such variables: total asset turns, inventory turns, gross margin, and gross margin return on inventory investment.

Stock returns are commonly used by managers, investors and analysts alike to compare the performance of firms. However, one concern with using stock returns without risk-adjustment is that different firms have different risk profiles so that a 20% return achieved by a low risk firm may not be comparable to a 20% return achieved by a high risk firm. We control for these differences by computing risk-adjusted stock returns and estimating alternative models using them as the dependent variable instead of raw stock returns.

The risk-adjusted stock returns or unexpected stock returns are computed using the 3 factors model of Fama and French as follows. Let R_{it} denote the monthly stock return for firm i in month t, R_{mt} denote the value-weighted market return on NYSE, AMEX and NASDAQ, and R_{ft} denote the risk-free return obtained on 1-month T-bills. All these values are obtained from CRSP time-series records. According to Fama and French (1993), the expected return on a stock portfolio in excess of the risk-free rate [$E(R_{it}) - R_{ft}$] is explained by the sensitivity of its return to three factors: (i) the excess return on a broad market portfolio ($R_{mt} - R_{ft}$), (ii) the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB_t small minus big), and (iii) the difference between the return on a portfolio of high-book-to-market stocks and the return on a portfolio of low-book-to-market stocks (HML_t high minus low). Time-series values of SMB_t and HML_t have been compiled by Fama and French. Using monthly closing stock prices (adjusted for dividends and stock splits) for a retail firm and monthly time-series values of the three factors, we estimate the following regression equation.

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1} (R_{mt} - R_{ft}) + \beta_{i2}\, SMB_t + \beta_{i3}\, HML_t + \varepsilon_{it} \qquad (8)$$

If the firm had no abnormal return, the intercept, α_i, in this regression should be zero. The unexpected or risk-adjusted return for firm i is defined as the value of the intercept α_i obtained from the regression. We replace R_t with α_i and re-estimate equations (1), (2) and (3) to verify if the managerial levers have an impact on this measure of firm success as well.

To ensure that the results of the models defined above are not influenced by the time period over which data were obtained, we estimated the model equations over several time periods of different lengths and with different start and end years. If the results of the hypotheses are found to be consistent regardless of time period then we shall conclude that our findings are not artifacts of the time period analyzed.

After estimating the model equations, we test the following hypotheses.

HYPOTHESIS 1: *Firms with higher return on assets, higher sales growth rates, and lower standard deviation of return on assets achieved higher long-term stock returns.*

HYPOTHESIS 2: *Firms with higher gross margin return on inventory investment relative to their retail industry segment achieved higher long-term stock returns.*

HYPOTHESIS 3: *Firms with higher return on assets, higher sales growth rates, and lower standard deviation of return on assets achieved higher long-term stock returns adjusted for risk.*

3.2 Interrelationships between performance levers

We analyze how firms achieve superior performance on the aggregate managerial levers (return on assets, return on equity, sales growth, and gross margin return on inventory investment) by studying the following interrelationships across firms: between inventory turns and gross margin, between gross margin and SG&A expenses, and between return on assets and sales growth. By quantifying these interrelationships, we propose to provide tools for comparing performance across firms on these levers, and to characterize the strategies followed by successful firms.

All firms that filed for bankruptcy are excluded from the analysis in this section. These firms may be expected to perform poorly on many performance measures (e.g., low return on assets and low sales growth, low gross margin and poor inventory turns, etc.) and may lie below the tradeoff curves identified for healthy firms.

Gross Margin and Inventory Turns

In a competitive market with low entry- and exit-barriers, a retailer that has to carry a unit of product longer before being able to sell it (i.e., a retailer with slower inventory turns) would expect to earn substantially more on its inventory investment (i.e., achieve a higher gross margin) than a retailer that has to carry the item of inventory for a shorter period. High variety fashionable products like jewelry and fashion apparel belong to the first category, while grocery and computer retailing belong to the second. The CEO of CompUSA Inc., a computer retail chain with gross margin of 5 to 15%, once remarked: "We have high inventory turns because we have to." Thus, we expect to see an inverse relationship between gross margin and inventory turns as shown in figure 3. In economic terms, we would expect retailers within the same segment to achieve similar return on inventory, which is measured using GMRoII. Since

GMRoII is a product of gross margin and inventory turns, we would expect these two variables to be inversely related.

$$GM_i \times IT_i = K_s,$$

where K_s is a constant specific to each segment. Equivalently, using logarithms,

$$\log(IT_i) = K_s + b \log(GM_i) + \varepsilon_i \quad (9)$$

It is important to note that since the model is cross-sectional and not time-series, the inverse relationship does not imply that if a firm increases its gross margin through better management, its inventory turns will decline commensurately. Instead, we propose that the correlation between gross margin and inventory turns exists due to their mutual dependence on the characteristics of a retailer's business.

Our main hypothesis of interest is as follows:

HYPOTHESIS 4: *Firms with high gross margin have low inventory turns and vice versa, i.e., $b<0$ in equation (9).*

Gross Margin and SG&A Expenses

Another implication of the assumption of competitive markets is that retailers with high gross margins would expect to spend more on advertising and promotion, and thus, have high SG&A expenses. In order to test this hypothesis, we correlate average gross margin with average SGA as a proportion of sales using a cross-sectional model.

$$GM_i = a_s + b\,(SGA/Sales)_i \quad (10)$$

As before, the subscript s denotes the industry segment. The hypothesis will hold true if $b>0$. We estimate the model over periods of different lengths with the expectation that the relationship over longer periods will be stronger than that over shorter periods.

HYPOTHESIS 5: *Firms with higher gross margin as a fraction of sales have higher SG&A expenses as a fraction of sales and vice versa.*

Note that if the competitive market assumption holds true then it also implies a much stronger statement that, in expectation, both types of strategies, high gross margin and high SGA versus low gross margin and low SGA, should be equally profitable. This is formulated as the next hypothesis:

HYPOTHESIS 6: *The slope b in equation (10) has a value of 1. In other words, a one point increase in gross margin (as a percent of sales) is associated with a one point increase in SG&A*

expenses (as a percent of sales), so that firms with different gross margins achieve similar return on sales on average.

Return on Assets and Sales Growth

It is widely expected that retailers with higher sales growth should have lower return on assets compared to its competitors for the following reasons:

1. In order to achieve rapid sales growth in a particular period, the retailer would open new stores during or before that period more aggressively than its competitors, and new stores being less profitable than old stores, this would reduce its return on assets.
2. The retailer might reduce its prices and increase spending on advertising and promotion to achieve high sales growth. Both these actions result in lower return on assets.

Amazon.com is a classic example of firms sacrificing return on assets for sales growth. Best Buy is another example because, as we observe from figure 2, it has the lowest return on assets and the highest sales growth rates of the firms considered. We test this relationship by using a cross-sectional model to regress average sales growth on average return on assets over time periods of length 1, 5, 10, 15, and 19 years, similar to the method used for gross margin and SGA above. For annual data, low return on assets in one year may be expected to correlate with high sales growth in the next year. Thus, we estimate the one year model both with and without time lag between return on assets and sales growth. However, for longer periods, time lag is disregarded. The hypothesis to be tested is as follows:

HYPOTHESIS 7: *Firms with low return on assets have high sales growth and vice versa.*

Note that the results of this hypothesis may also have a bearing on the regression of stock returns on return on assets and sales growth in section 3.1 since it would indicate collinearity between the independent variables in that regression.

3.3 The relationship between bankruptcy and sales growth

As noted earlier, retail firms show a very high incidence of bankruptcy. Firms that have filed under chapter 11 include not only small retailers but also large chains like Ames Department Stores, Caldor, Federated, Jamesway, Today’s Man, Filenes’ Basement, etc. Firms that have had a close brush with bankruptcy include the likes of K-Mart and Best Buy. Why is bankruptcy so rampant in retailing? Understandably, as researchers in accounting have noted, bankruptcy reflects a liquidity crunch at a company. The objective of our research is to understand why so many retailers become illiquid by relating the likelihood of bankruptcy to sales growth.

We theorize that bankruptcy risk relates to the difference between the growth targeted and the growth achieved by a retailer. Retailers targeting high growth rates have to increase assets such as stores, warehouse space, and inventory in anticipation of sales growth. Often the asset growth has to precede the anticipated sales growth substantially. Retailers that attempt to grow faster than their potential accumulate unproductive assets. When a retailer targeting a certain growth rate fails to achieve it, its risk of bankruptcy increases.

The sales growth-asset growth mismatch scenario described above has been seen in many retail segments. Most recently, the footwear-retailing segment has fallen prey to this problem. Years of solid growth in both women's footwear and athletic footwear induced the industry to project that the sales growth would continue. When the sales growth did not materialize, retailers like Nine West Group Inc. got stuck with unproductive assets, and encountered poor performance. Examples of retail firms that filed for bankruptcy because of growing too fast (adding too many stores too quickly) include Merry Go Round Enterprises and All For A Dollar Inc. Best Buy went into near bankruptcy in 1995 because of very high growth rate in early 1990s. However, we did not find sufficient evidence to relate bankruptcy to financial leverage. Contrary to our expectations, we found that financial leverage of bankrupt firms was not significantly higher than that of healthy firms in the years preceding bankruptcy. We found several retail firms that went bankrupt in spite of low long-term borrowings. The results from this analysis will not be reported here for brevity.

There are two alternative scenarios that can be developed to test our theory.

1. Retailers that went bankrupt targeted higher growth rates than healthy firms.
2. Retailers that went bankrupt had a greater mismatch between targeted and realized growth rates than healthy firms.

The first scenario is more restrictive than the second. It argues that retailers that filed for bankruptcy attempted to grow more aggressively than their healthier counterparts, and thus, faced a higher risk of bankruptcy. The validity of this scenario can be tested by comparing the fixed assets growth rates of healthy retailers with those of bankrupt retailers in the years preceding the event of bankruptcy. If this scenario exists then we can develop a predictive model of bankruptcy which estimates the probability of a retailer going bankrupt as a function of its fixed assets growth rate.

The second scenario implies that bankrupt retailers did not necessarily attempt to grow more aggressively than healthy retailers but they could not achieve their targeted growth rates either because of execution problems or because they attempted to grow faster than their potential. Thus, the bankrupt retailers show a greater mismatch between targeted and realized growth rates than healthy retailers. This hypothesis can be tested by comparing the time rate of change of fixed assets productivity (i.e., fixed asset turns) of healthy and bankrupt retailers in the years preceding bankruptcy. If the hypothesis holds then the fixed asset turns of bankrupt retailers should decline more rapidly than that for healthy retailers. In this case, a predictive model can be developed to estimate the probability of a retailer going bankrupt as a function of the changes in its fixed assets productivity.

We test the following hypotheses to find which of the above two scenarios holds. Hypotheses 8 and 9 establish the grounds for relating bankruptcy to sales growth. Hypothesis 8 states that sales growth rate of a retail firm declines over time because as it fills its market space, there are fewer and fewer avenues available for growth. Hypothesis 9 ascertains whether retailers that filed for bankruptcy had lower realized growth rates than healthy retailers in the years preceding the incidence of bankruptcy. Hypothesis 10 tests whether bankrupt retailers attempted to grow more aggressively than healthy retailers in order to determine the validity of scenario 1. Lastly, hypothesis 11 determines the validity of scenario 2.

HYPOTHESIS 8: *Sales growth and asset productivity show decreasing trends over the life of a retail firm.*

HYPOTHESIS 9: *Retailers that filed for bankruptcy have lower sales growth rates during the years preceding bankruptcy than healthy retailers.*

HYPOTHESIS 10: *Retailers that filed for bankruptcy have higher fixed assets growth rates during the years preceding bankruptcy than healthy retailers.*

HYPOTHESIS 11: *Fixed asset turns decrease over time more rapidly for bankrupt firms than for healthy firms.*

We test hypotheses 9 and 10 by comparing annual fixed assets and sales growth rates of retailers that filed for bankruptcy with the average rates for healthy retail firms (in the years preceding bankruptcy). For testing hypotheses 8 and 11, we conduct time-series regressions of sales growth and fixed asset turns with respect to time. The regression equation for sales growth rate is

$$g_{it} = \alpha_i + \beta\, t + \varepsilon_{it} \tag{11}$$

and hypothesis 8 implies that $\beta < 0$. The regression equation for fixed asset turns is more complex because fixed asset turns vary significantly across retail segments. We standardize time series values of fixed asset turns to mean 0 and standard deviation 1 by firm to ensure comparability across firms and estimate the following quadratic model separately for healthy and bankrupt firms. The time-series for bankrupt firms are aligned such that the year of bankruptcy corresponds to the same value of t and all data available before the year of bankruptcy are used. A quadratic term in t is added because firms, before filing for bankruptcy, close many stores to try to tide over the oncoming liquidity crisis. This increases their asset turns in the one-two years before bankruptcy. Here FT_{it} denotes standardized fixed asset turns for firm i in period t.

$$\text{Healthy Firms:} \quad FT_{it} = \alpha^h + \beta_1^h\, t + \beta_2^h\, t^2 + \varepsilon_{it}^h$$

$$\text{Bankrupt Firms:} \quad FT_{it} = \alpha^b + \beta_1^b\, t + \beta_2^b\, t^2 + \varepsilon_{it}^b \tag{12}$$

Hypothesis 8 implies that $\beta_1^h < 0$ and $\beta_1^b < 0$, and hypothesis 11 implies that $\beta_1^b < \beta_1^h$.

4. Data

Accounting data for this study were obtained from S&P's Compustat database and the monthly stock price, stock return and market index data were obtained from CRSP. We obtained data for all public listed "brick & mortar" retail companies over the 20 year period 1978-97 which comprised the following industry segments: Apparel and Accessories, Convenience stores, Department stores, Drug and pharmaceuticals, Grocery, Hobby toys and games stores, Home furnishings, Jewelry, Consumer electronics and computers, and Variety stores. The database contains a total of 346 companies. For each company, we computed performance variables as defined in appendices 1 and 2.

From this set, we chose companies for testing hypotheses 1, 2 and 3 for different time periods of length 5, 10, 15 and 19 years. The firms selected in each case satisfy two conditions: (i) they should have time series data for the entire time period under consideration; (ii) they should not have gone bankrupt, been bought by another company or been de-listed from the stock exchange for other reasons during this period. The final sample size used for each time period is shown along with the results. The total number of distinct firms numbered 150 across 12 industry segments. Surprisingly, in each case the number of firms is less than one-fourth of the total sample size of 346 firms, with the 19 year period having only 32 firms. This is in consonance with our earlier observation that not many retail firms survive for a long period of time.

For the second set of hypotheses, 4 through 7, pertaining to interrelationships between performance levers, we used average values for the variables concerned for all healthy firms that had data available for the relevant time periods. The time periods over which averages were computed are indicated in the respective tables containing the results.

For the third set of hypotheses, 8 through 11, we constructed two samples of firms; one a sample of all firms that had gone bankrupt and had at least 5 years of data available before the year of bankruptcy; and the second, a sample of all firms that did not go bankrupt during the 20 year period 1978-97 and had at least five years of data available.

5. Results

5.1 Association between stock returns and accounting based performance variables

The results for the regression of stock returns on return on equity and sales growth, and on return on assets, sales growth, standard deviation of return on assets and financial leverage are shown in table 2. Before interpreting these results, we note that in the cases where time-periods overlap, the results are not independent of each other. The reasons for using different time windows are to control for the effect of beginning and ending years on stock returns, and to test how results vary with the length of the period. We also note that there is some collinearity between return on assets and sales growth, and likewise between return on equity and sales growth for longer time periods. Firms with greater profitability in the long run tend to be the firms with higher sales growth as well. This finding is discussed in detail below along with the results for hypothesis 7. In most cases, the collinearity was not large enough to affect the parameter estimates. Doing principal components analysis on the independent variables also gave us components that were almost the same as the original variables. However, in three cases, we eliminated sales growth from the model because of high collinearity.

We make the following observations from these two tables:

1. Hypothesis 1 holds. The association between the independent variables and stock returns is significant in almost every case. Return on assets and sales growth have positive correlation and standard deviation of return on assets has negative correlation with stock returns. Financial leverage, where significant, has a positive correlation with stock returns, so that firms with high leverage have high stock returns.
2. Return on assets, standard deviation of return on assets, sales growth and financial leverage explain between 35 to 72 per cent of the variation in stock returns. These number are as high as those obtained for return on equity and sales growth, showing the importance of managing the component levers of return on equity.
3. Our results are consistent with prior studies done in financial accounting. Specifically, the values of R-square obtained are comparable to those obtained by Easton, Harris and Ohlson (1992) for the association between net earnings and stock returns. The value of R-square is higher for longer time periods than for shorter time periods. The standard error of stock return is also found to be lower for longer time periods.

One question often asked by retailers is which variable is stock return more sensitive to—sales growth or profitability. In order to answer this question, we conducted standardized regression of stock returns on the independent variables, i.e., we standardized all variables to mean 0 and standard deviation 1 and then estimated the regression equations. Standardization controls for differences in the units used to express the independent variables, and differences in the level of variation in their values. Table 3 shows the coefficient estimates from these regressions. We see that the coefficient of return on equity is always larger than the coefficient of sales growth. Thus, the long-term stock returns are more sensitive to a unit standard deviation change in return on equity than to a unit standard deviation change in sales growth. The picture as regards return on assets versus sales growth is less clear. Stock return seems to be equally sensitive to a change in either of them. We think that the different levels of sensitivity to RoE and RoA are found because of financial leverage. For example, consider a firm with RoA of 10% and equity constituting 40% of its total book value. The RoE of this firm is 25%. Suppose it doubles its RoA to 20%, keeping leverage constant. The RoE of the firm also doubles to 50%. If all firms in the cross-sectional model had identical financial leverage (or if financial leverage had no impact on stock returns) then the standardized coefficients of RoA and RoE in the above regressions would be the same and it would be irrelevant whether we use RoA or RoE as independent variables. However, as we have already seen, leverage has a positive association with stock returns. Thus, the stock market is slightly more sensitive to changes in RoE than to changes in RoA.

The results of the regression of stock return on GMRoII, sales growth and financial leverage are shown in table 4. The coefficient of GMRoII is consistently positive, and in five out of eight cases, it is significant at more than 90% confidence level, confirming hypothesis 2. It is intuitively expected that the association between GMRoII and stock return should not be as strong as between return on assets and stock return because GMRoII is only one component of return on assets. Good performance by a retailer on GMRoII does not necessarily imply good operating profitability since the retailer may be incurring disproportionately high selling expenses or may have too small an investment in inventory (low inventory to assets ratio).

The conclusions from estimating equations (4) and (5) are similar to those obtained from equation (1). Table 5 shows the results for one of the time periods examined, 1988-97. We find that the coefficients of gross margin and SG&A expenses are equal and opposite with more than 99% confidence level. The stock market values their difference, operating earnings, while giving equal weights to gross margin and SG&A expenses.

Lastly, we also estimated the impact of the above levers on risk-adjusted stock returns. We used a single data set here consisting of all firms with at least 10 years of data that did not file for bankruptcy at all during 1978-1997. The results obtained are consistent with those in tables 2 and 4. Return on equity, return on assets, and sales growth have statistically significant positive association with stock returns. Standard deviation of return on assets, financial leverage and GMRoII also have coefficients in the expected directions, but their estimates are not statistically significant.

5.2 Interrelationships between performance variables

Inventory Turns and Gross Margin

Figure 4 shows the relationship between gross margin and inventory turns for consumer electronics retailers using quarterly time-series data for ten years, demonstrating the inverse logarithmic relationship we expect to see. Table 6 gives the results of the regression for all retail segments using two groups of firms: one with all firms with at least ten years of data during 1978-97 and another with all firms with at least five years of data during this period. The first set of firms is smaller and has more time-series information about each firm, but doing the regression for a larger set as well gives us an indication of the robustness of the results. Inventory turns have a very strong relationship with gross margin with R-square of about 64% and all parameters being significant at 99%. Retailers with high inventory turns have low gross margins, and vice versa. However, the coefficient of log GM is not -1 but about -0.5, indicating that GMRoII does not remain constant as GM and IT vary between retail firms. This is so because, as GM and IT change, SGA intensity and inventory intensity also change systematically so that retailers in a retail segment need not have similar gross margin return on inventory even though they expect to have similar return on assets.

Gross Margin and SG&A Expenses

We regressed average gross margins against average SG&A expenses (as a percent of sales) for time periods of lengths varying from ten years to one year in the period 1988 to 1997. Table 7 shows the results for the ten-year period 1988-97 and for the year 1997. Retail segment-specific intercepts were not required as industry effect on the model was found to be negligible. The R-square for the ten-year period is 82.2% and the regression model is highly significant, providing evidence for hypothesis 5. The R-square for the one-year period is also surprisingly high at 74.3%. Figure 5 presents a plot of average gross margin versus average SG&A expenses for the ten-year period; it can be seen from the plot that the model fits extremely well and the residuals of the regression equation are quite low. In both the time-periods, the slope of SGA is not different from 1 with a confidence level of 95%. Thus, we also accept hypothesis 6.

An estimate of 1 for the slope and the surprisingly small residuals indicate the existence of an equilibrium in the market wherein GM and SGA compensate each other very strongly. Retailers with superior performance distinguish themselves by locating above the regression line, and retailers with poor performance (for example, firms that filed for bankruptcy) lie below the regression line. This is consistent with the results of estimation of equations (4) and (5) given in table 5. The equal and opposite coefficients of gross margin and SG&A expenses imply that their difference, operating earnings, correlates well with stock returns.

Return on Assets and Sales Growth

We did not find any evidence to support hypothesis 7. Quite to the contrary, return on assets and sales growth have positive correlation with each other for almost all sub-periods during 1978 to

97. The extent of association is stronger for longer time periods than for shorter periods. When we estimated the interrelationship using one-year data with time lag, we found that return on assets in a year did not have any statistically significant association with sales growth in the next year. Quarterly data may be more appropriate for testing a time-lagged relationship between return on assets and sales growth.

5.3 The relationship between bankruptcy and sales growth

Table 8 shows the results of regressing time-series sales growth of each retailer on number of years as independent variable to find if there is a declining trend in sales growth, as specified in the generalized linear model equation (11). When the slope parameter is modeled to be identical across retailers, we find that the R-square is 32.2% and the estimate of slope is highly significant with an estimate of –0.997. The negative value of this estimate confirms the first part of hypothesis 8 that sales growth rates of retailers decline over time. We also estimated the model using different slope parameters for different firms. In this case, the R-square is understandably higher at 50.5% and both the firm effect and the time effect are again highly significant. The median value of the slope β_i across retailers is –0.941 (which is close to the estimate obtained using a single slope parameter) and 147 out of the 185 companies in the sample have negative slopes. Thus, for an average retailer, sales growth rate declines at a rate of about 1 percentage point per year.

Table 9 shows the estimated sales and fixed assets growth rates of healthy firms and bankrupt firms in the years preceding bankruptcy. The average annual sales growth rate of a healthy retail firm is 13.92%. The average sales growth rate of a firm that filed for bankruptcy decreases from 7.38% four years before bankruptcy to 3.22% three years before bankruptcy, 0.67% one year before bankruptcy and –12.43% during the year of bankruptcy. In every year, the sales growth rate of bankrupt firms is lower than that of healthy firms and in three cases, it is statistically significant at 99% and hypothesis 9 is accepted.

The fixed assets growth rate of bankrupt firms is not higher than that of healthy firms in any year. Thus, hypothesis 10 is rejected and scenario 1 does not appear to hold generally for all bankrupt firms. In other words, firms that file for bankruptcy do not necessarily attempt to grow faster than healthy firms in the years preceding the occurrence of bankruptcy.

The results of estimating equations (12) are as follows. The figures in parentheses are standard errors of parameter estimates and all values are significant at 95% or higher confidence levels.

Healthy Firms: $FT_{it} = \underset{(0.062)}{0.60} \; - \underset{(0.013)}{0.031\,t} \; - \underset{(0.0006)}{0.002\,t^2} \; + \varepsilon_{it}$ $\qquad R^2 = 16.12\%$

Bankrupt Firms: $FT_{it} = \underset{(3.885)}{11.89} \; - \underset{(0.477)}{1.298\,t} \; + \underset{(0.014)}{0.034\,t^2} \; + \varepsilon_{it}$ $\qquad R^2 = 18.57\%$

Since the coefficients of t in both equations are negative, it confirms that fixed asset productivity declines over time for all retailers (hypothesis 8). Also, the estimate –1.298 is less than –0.031 at 99% confidence level, confirming that bankrupt firms exhibit a much faster decline in fixed asset productivity in the years preceding bankruptcy than healthy firms. This indicates that "scenario 2" provides a plausible explanation of the occurrence of bankruptcy in retail firms.

6. Conclusion

We have used financial statement and stock market data for public listed retail firms to study various managerial levers and assess their relationship with firm success measured by long-term stock returns and the incidence of bankruptcy. Some of our results confirm our intuition: (1) retailers with superior long-term stock returns have high return on assets, high sales growth, and high gross margin return on inventory; (2) grocery firms have higher inventory turns and lower gross margin than jewelry firms, and other retail segments lie between the two as expected; and (3) retailers that went bankrupt showed more rapid decline in asset productivity than healthy retailers.

However, we have also uncovered some surprises and some new findings: (1) return on assets is not negatively correlated with sales growth; (2) retailers in different segments have similar return on assets and return on equity, although their component measures have very different values; (3) there are strong associations between gross margin and inventory turns, and between gross margin and selling, general and administrative expenses, showing that firms achieve success in many different ways; (4) stock returns have a negative correlation with standard deviation of return on assets; (5) retailers that went bankrupt were not targeting higher growth rates than healthy retailers; and (6) bankruptcy in retailing is unrelated to financial leverage.

Our research achieves several objectives. It measures the impact of managerial levers like sales growth and profitability on the overall long-term firm success. It documents the widely different strategies that retailers use to achieve similar results on profitability. It provides rules that can be used to compare the performance of one company with another by recognizing the tradeoffs between performance variables. Lastly, it provides a methodology that can be used to study the impact of managerial levers on success in other industries.

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Appendix 1: Notation

i	firm index
s	retail segment index (e.g., apparel, grocery, consumer electronics, etc.)
t	time index, representing either years or quarters, as the case may be

Income Statement and Balance Sheet Items:

S	Sales (Net of markdowns)
CGS	Cost of Goods Sold (includes occupancy and distribution costs)
SGA	Selling, General and Administrative Expenses
EBITDA	Operating Profit (Earnings before interest, tax, depreciation and amortization expenses)
FA	Fixed Assets
Inv	Inventory
TA	Total Assets
OE	Owners' Equity

Performance Measures (defined in appendix 2)

GM	Gross Margin (%)
OM	Operating Margin (%)
AT	Total Asset Turns
IT	Inventory Turns
FT	Fixed Asset Turns
GMRoII	Gross Margin Return on Inventory Investment (%)
RoA	Return on Assets (%)
RoE	Return on Equity (%)
g	Sales Growth Rate (%)
h	Fixed Assets Growth Rate (%)
DE	Financial Leverage (Ratio of long-term debt to equity)
σ-RoA	Standard deviation of RoA over some time period
ΔGMRoII	GMRoII standardized to mean 0 and standard deviation 1 by industry segment

Appendix 2

Definition of Accounting Statements based Performance Measures

Return on Equity $RoE_t = \frac{PAT_t}{(OE_{t-1} + OE_t)/2}$

Return on Assets $RoA_t = \frac{EBITDA_t}{(TA_{t-1} + TA_t)/2}$

Components of Return on Assets:

Operating Margin $OM_t = \frac{EBITDA_t}{S_t}$

Gross Margin $GM_t = \frac{\text{Gross Profit}_t}{S_t} = \frac{S_t - CGS_t}{S_t}$

Total Asset Turns $AT_t = \frac{S_t}{(TA_{t-1} + TA_t)/2}$

Inventory Turns $IT_t = \frac{S_t}{(Inv_{t-1} + Inv_t)/2}$

Gross Margin Return on Inventory $GMRoII_t = \frac{S_t - CGS_t}{(Inv_{t-1} + Inv_t)/2} = GM_t \times IT_t$

Break-up of Return on Assets into component measures:

$$\begin{aligned} RoA_t &= OM_t \times AT_t \\ &= GM_t \times \left(1 - \frac{SGA_t}{S_t}\right) \times \left(\frac{Inv_{t-1} + Inv_t}{TA_{t-1} + TA_t}\right) \times IT_t \\ &= GMRoII_t \times \left(1 - \frac{SGA_t}{S_t}\right) \times (\text{Inventory to Assets Ratio})_t \end{aligned}$$

Figure 1a

Histogram of Average Annual Stock Returns of Retail Firms during 1978-97

(Data: 293 out of 346 firms that had at least 2 years of stock return history)

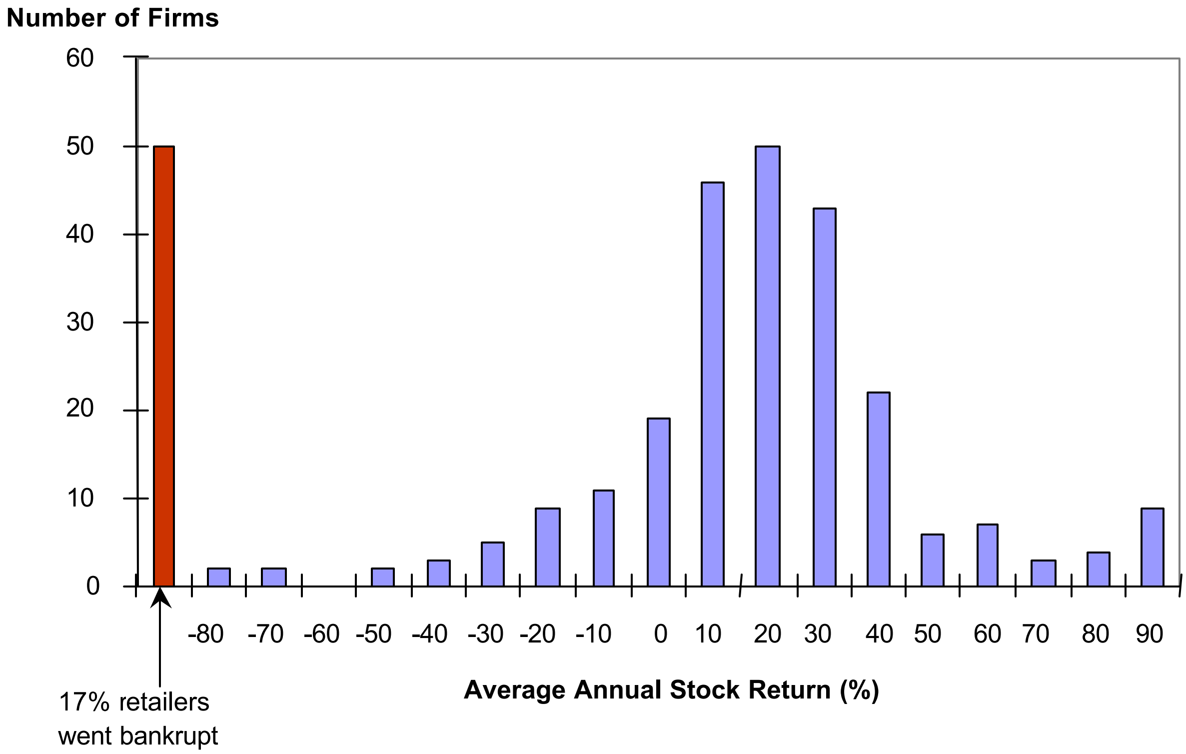


Figure 1b

Histogram of Average Annual Returns of Firms in the S&P 500 index on Dec 31, 1978 during the period 1978-97

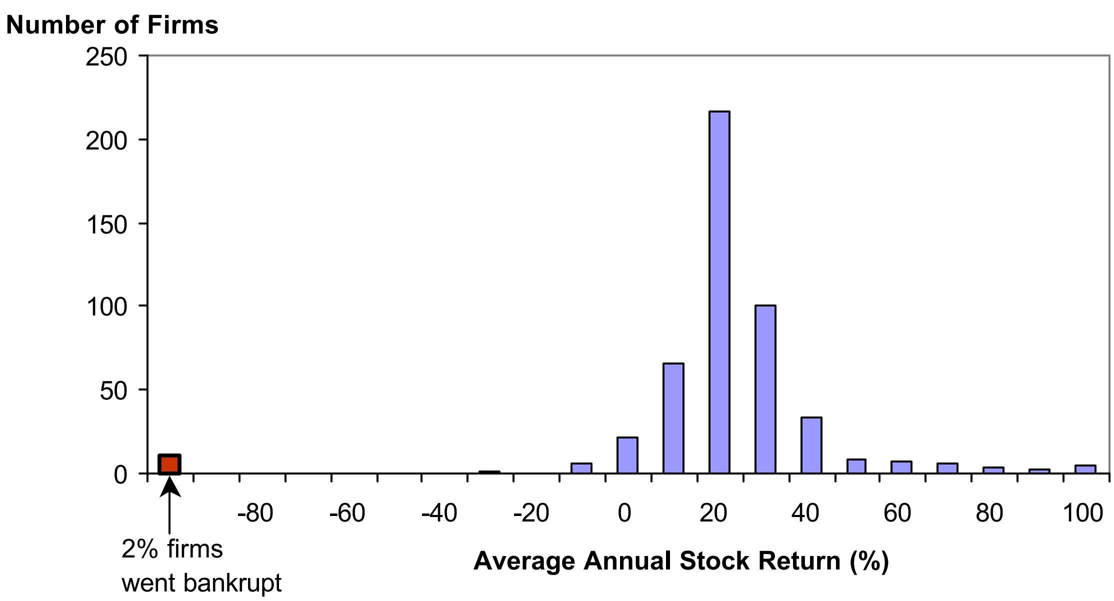
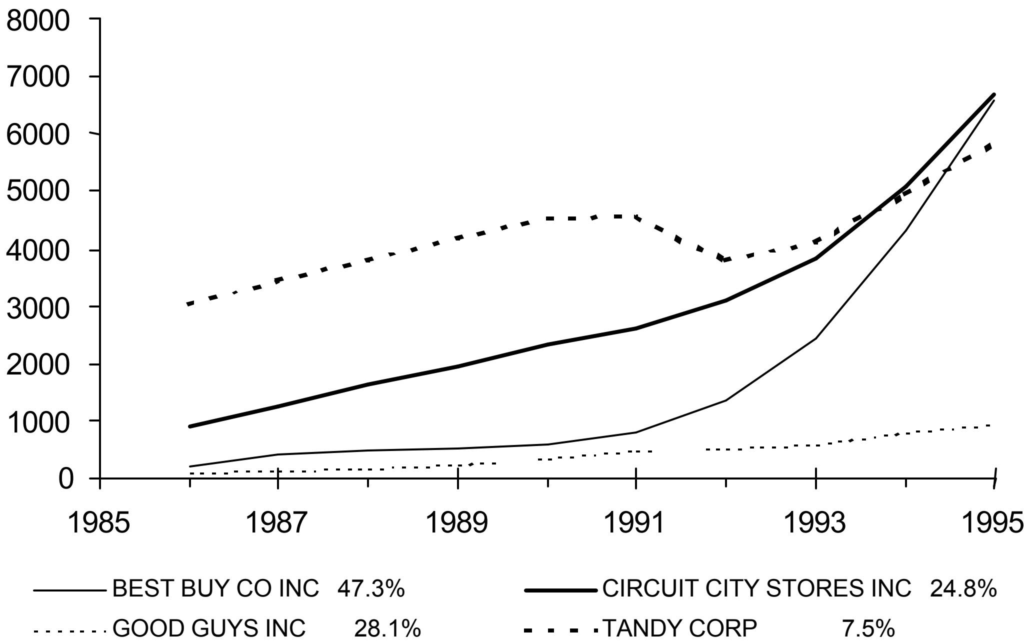
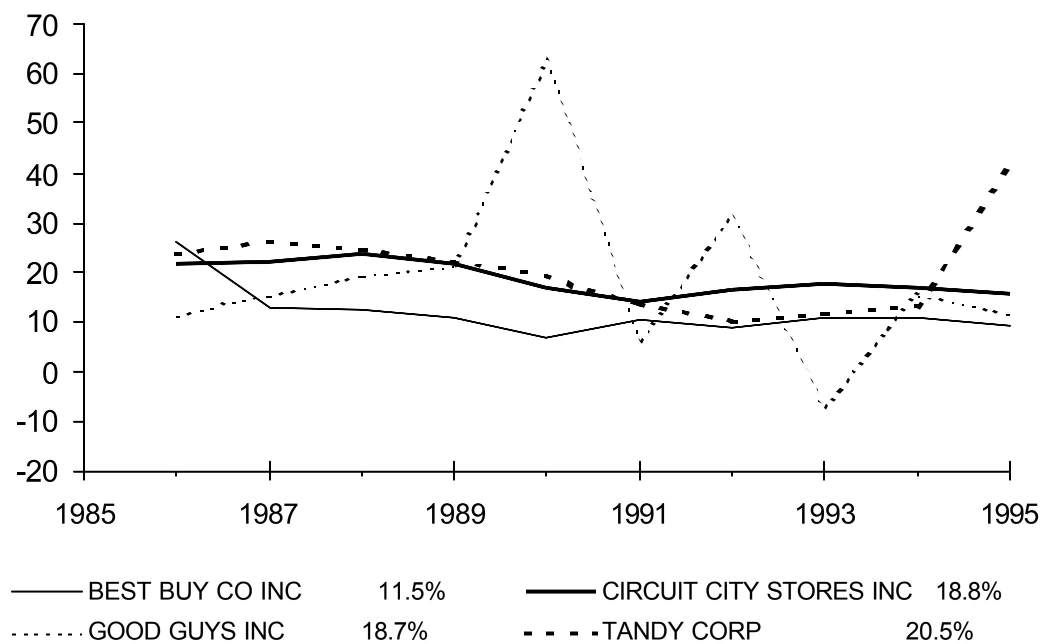


Figure 2: Time Series of Performance Measures for Four Consumer Electronics Retailers from Dec 1985 to Dec 1995[4]

(a) Annual Sales in $ million

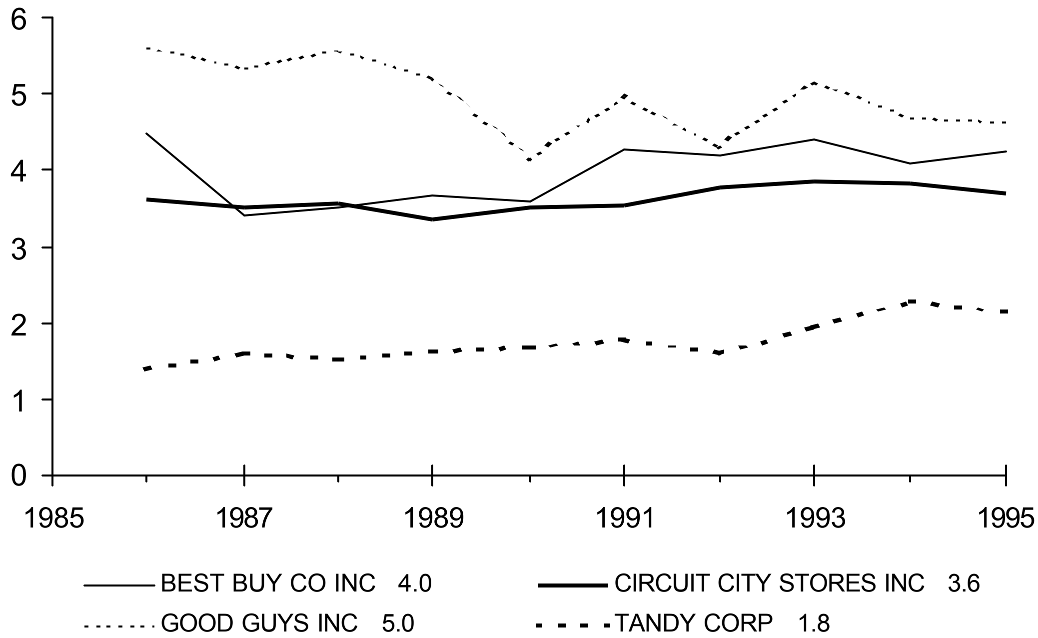


(b) Annual per cent Return on Assets

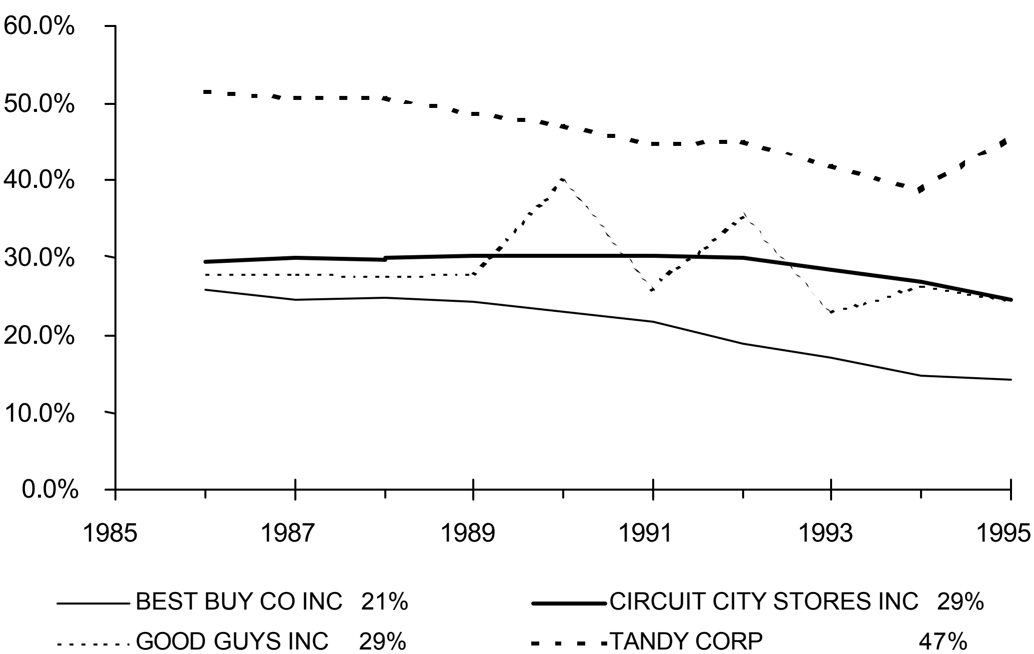


[4] Numbers in the legends give average values of sales growth rate, return on assets, inventory turns, gross margin and annual stock returns respectively over this period.

(c) Average Annual Inventory Turns



(d) Average Annual per cent Gross Margin



(e) Value of $1 investment over time

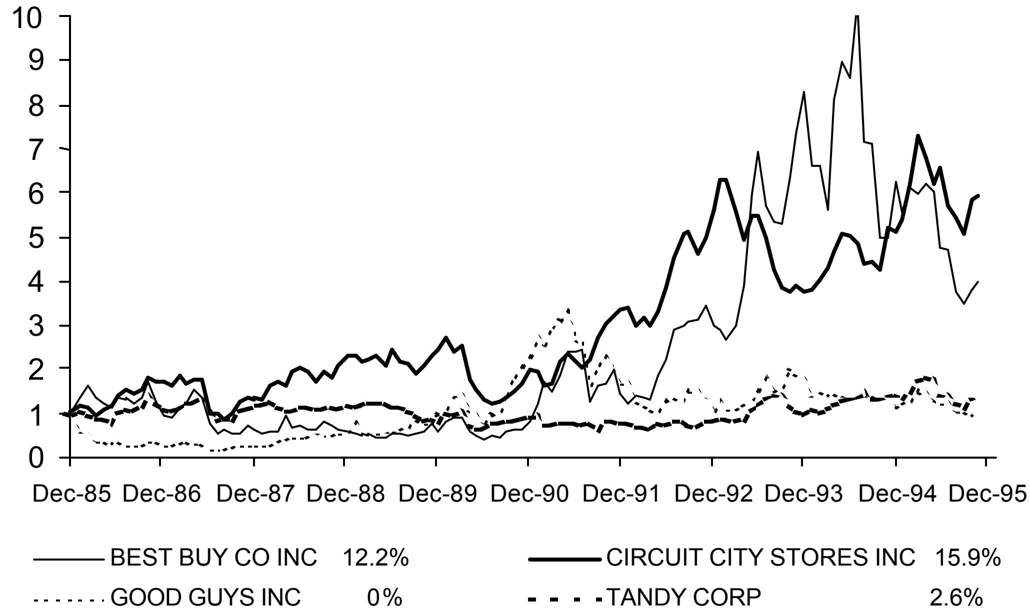


Figure 3: Inverse logarithmic relationship between gross margin and inventory turns

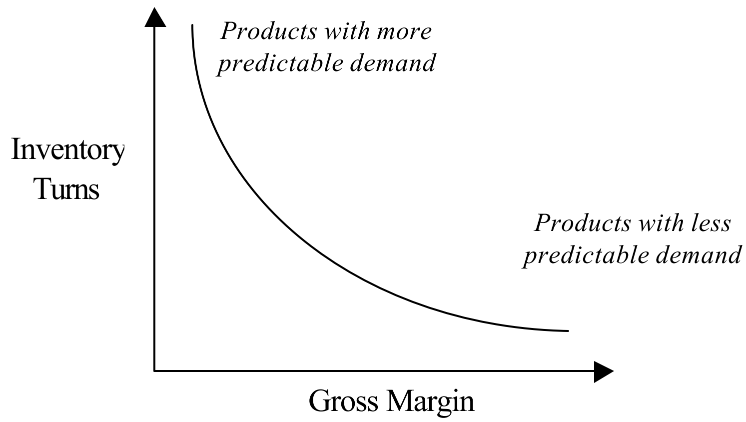


Figure 4: Quarterly Gross Margins and Inventory Turns for all Consumer Electronics Retailers for 1986-95

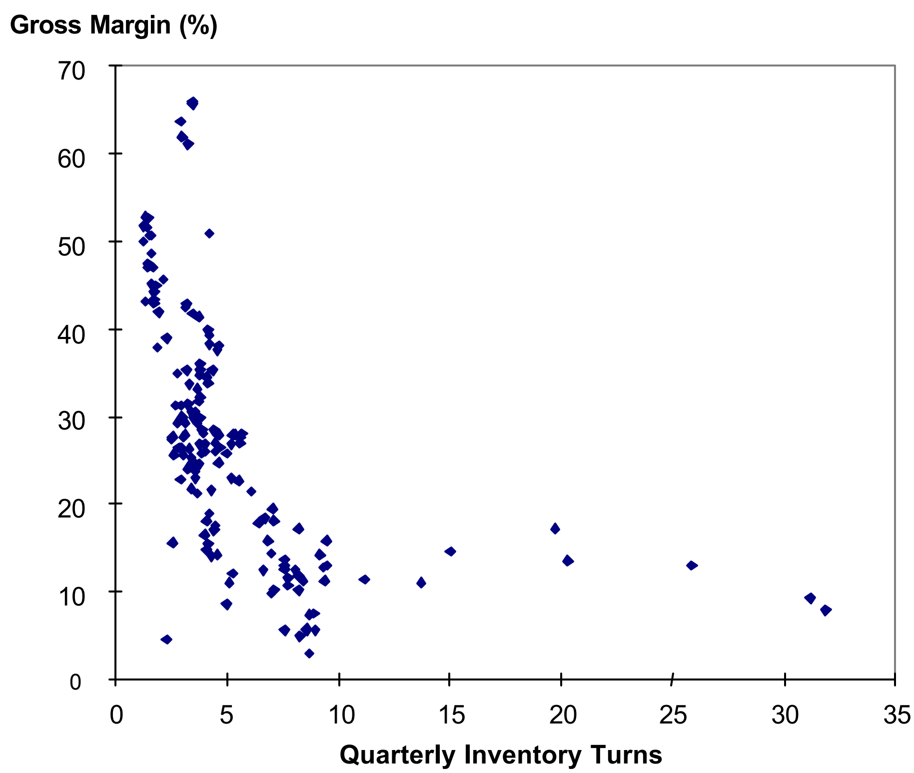


Figure 5: Average Gross Margin Vs Average SGA Expenses for all Retail Firms for 1988-97

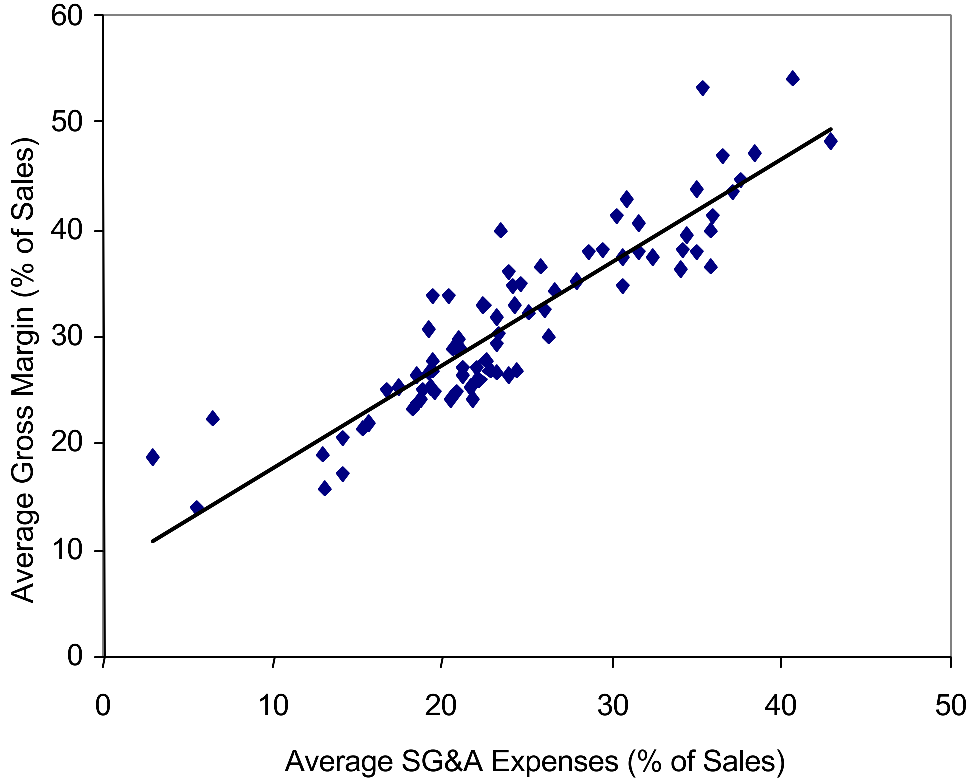


Table 1: Estimation of effect of retail segment on various model variables using ANOVA

$$y_{is} = a_s + e_{is}$$

where y_{is} is the average value of a performance variable (IT, GM, RoA, etc.) for firm i in retail segment s over some period of time. The independent variables are indicator variables for various segments. For this analysis, we used all retail firms with at least 5 consecutive years of data available in 1978-97.

Number of Industry Segments for each model variable: 10
Number of firms: 144

y_{is}	AT	GM	GMRoII	IT	RoA	g	RoE	DE[1]
R-square	0.475	0.433	0.325	0.530	0.073	0.073	0.018	0.155
F-statistic for α_s	13.45[a]	11.37[a]	7.18[a]	16.77[a]	1.17	1.18	0.28	2.74[b]
Average Values for Retail Segments for Variables with significant F-statistics								
Apparel and accessory stores	2.22	36.13	239.7	6.64				
Convenience stores	3.55	21.38	474.3	21.34				
Department stores	1.79	32.15	245.1	7.75				
Drug & proprietary stores	2.99	25.48	171.1	7.00				
Grocery stores	4.06	24.48	392.9	16.28				
Hobby, toy and game shops	1.68	31.44	132.8	4.29				
Home furniture & equip store	1.68	43.41	173.6	4.01				
Jewelry stores	1.42	52.44	138.1	2.64				
Radio, TV, Cons. Electronics stores	2.73	33.12	167.1	5.38				
Variety stores	2.65	27.43	152.4	6.13				

[a] significant at 0.0001
[b] significant at 0.01

[1] For DE (financial leverage), although the F-statistic is significant at 0.01, we did not find significant differences at 95% confidence level between any pair of retail segments using any of the following tests, Bonferroni, Tukey, and Scheffe.

Table 2: Results of the Regression of Stock Returns on RoE and Sales Growth, and on RoA, Sales Growth, Standard Deviation of RoA, and Financial Leverage

Time Period		Number of Firms	Stock Return Vs RoE and Sales Growth[1]				Stock Return Vs RoA, Sales Growth, σ-RoA, and DE ratio[1]					
			R^2	Intercept	RoE	Sales Growth	R^2	Intercept	RoA	Sales Growth	σ-RoA	DE ratio
19 yrs	1979-97	32	0.602	6.28	0.67	0.36	0.666	10.58	0.64	0.51	-1.52	-3.19
				(2.24)[a]	(0.18)[a]	(0.18)[b]		(6.37)	(0.27)[b]	(0.16)[a]	0.45)[a]	(3.36)
15 yrs	1983-97	35	0.629	7.90	0.57	0.40	0.717	-2.17	1.02	0.48	-0.75	3.54
				(1.82)[a]	(0.13)[a]	(0.16)[a]		(5.35)	(0.22)[a]	(0.14)[a]	(0.37)[b]	(2.65)
10 yrs	1979-88	42	0.374	12.04	1.06	-[2]	0.384	10.12	1.13	-[2]	-1.82	5.99
				(3.45)[a]	(0.22)[a]			(7.52)	(0.33)[a]		(0.69)[a]	(2.85)[b]
	1988-97	59	0.478	-2.38	0.57	0.32	0.528	-14.51	0.99	0.34	-0.006	4.54
				(1.60)	(0.11)[a]	(0.12)[b]		(4.29)[a]	(0.17)[a]	(0.12)[a]	(0.44)	(2.28)[b]
5 yrs	1979-83	81	0.423	10.28	1.39	-[2]	0.352	7.23	0.83	0.57	-0.62	3.02
				(2.59)[a]	(0.18)[a]			(5.19)	(0.28)[a]	(0.19)[a]	(0.57)	(2.16)
	1983-87	49	0.450	18.23	1.15	0.77	0.532	-12.75	1.45	1.19	1.33	19.64
				(5.35)[a]	(0.41)[a]	(0.30)[b]		(11.10)	(0.53)[a]	(0.28)[a]	(1.09)	(5.74)[a]
	1988-92	69	0.503	-9.49	0.78	0.74	0.471	-13.99	0.98	0.72	-0.44	-0.85
				(2.62)[a]	(0.16)[a]	(0.15)[a]		(5.63)[a]	(0.25)[a]	(0.17)[a]	(0.71)	(3.46)
	1993-97	93	0.250	-1.81	0.65	0.25	0.348	-16.91	1.41	0.29	-0.80	4.79
				(2.21)	(0.15)[a]	(0.11)[b]		(5.81)[a]	(0.29)[a]	(0.11)[a]	(0.59)	(2.51)[b]

[a] significant at 0.01
[b] significant at 0.05

[1] F-tests for all models are significant at 0.01. Figures in brackets below parameter estimates give their standard errors
[2] Sales Growth was not used as an independent variable in these cases because of collinearity with RoE or RoA.

Table 3: Standardized Coefficients for the Regression of Stock Return on RoE and Sales Growth, and on RoA, Sales Growth, Standard Deviation of RoA and Financial Leverage[1]

Time Period		Stock Return Vs RoE and Sales Growth		Stock Return Vs RoA, Sales Growth, σ-RoA and DE ratio			
		RoE	Sales Growth	RoA	Sales Growth	σ-RoA	DE ratio
19 yrs	1979-97	0.558	0.298	0.365	0.420	-0.433	-0.142
15 yrs	1983-97	0.561	0.325	0.613	0.391	-0.217	0.173
10 yrs	1979-88	0.611	-	0.444	-	-0.339	0.276
	1988-97	0.542	0.279	0.611	0.296	-0.004	0.209
5 yrs	1979-83	0.650	-	0.326	0.323	-0.102	0.133
	1983-87	0.390	0.354	0.360	0.547	0.134	0.404
	1988-92	0.445	0.442	0.392	0.431	-0.064	0.027
	1993-97	0.402	0.202	0.441	0.235	-0.130	0.168

[1] R^2 values and statistical significance of all coefficients are identical to those for corresponding non-standardized models in tables 3 and 4.

Table 4: Results of the Regression of Stock Return on DGMRoII, Sales Growth and DE ratio

Time Period		Number of Firms	R-square[1]	Parameter Estimates[2]			
				Intercept	ΔGMRoII	Sales Growth	DE ratio
19 yrs	1979-97	32	0.452	9.38	0.86	0.86	-1.85
				(3.82)[b]	(0.61)	(0.20)[a]	(3.28)
15 yrs	1983-97	35	0.530	6.81	1.28	0.97	0.78
				(3.39)[b]	(0.47)[a]	(0.18)[a]	(2.78)
10 yrs	1979-88	42	0.414	12.76	1.22	0.84	2.58
				(3.34)[a]	(0.80)	(0.18)[a]	(3.35)
	1988-97	59	0.286	-0.25	0.64	0.59	0.78
				(2.34)	(0.34)[c]	(0.14)[a]	(2.46)
5 yrs	1979-83	80	0.297	14.55	0.59	0.97	1.51
				(2.87)[a]	(0.60)	(0.17)[a]	(2.29)
	1983-87	48	0.517	17.01	2.58	1.57	7.72
				(5.82)[a]	(0.79)[a]	(0.24)[a]	(5.59)
	1988-92	68	0.378	-2.98	1.19	0.97	-2.43
				(3.36)	(0.59)[b]	(0.17)[a]	(3.62)
	1993-97	92	0.153	-1.19	0.99	0.38	3.86
				(2.80)	(0.46)[b]	(0.12)[a]	(2.77)

[a] significant at 0.01
[b] significant at 0.05
[c] significant at 0.10

[1] F-tests for all models are significant at 0.01
[2] Figures in brackets below parameter estimates give their standard errors

Table 5: Results of the Regression of Stock Returns on Gross Margin, SG&A Expenses, Inventory, and Total Assets for 1988-97

	Results of equation (4)[1]		Results of equation (5)[1]	
R^2	0.387		0.530	
Number of observations	59		59	
Intercept	-4.1	(4.7)	-1.38	(4.04)
Gross Margin per dollar investment in stock	15300	(2811)[a]	20959	(2788)[a]
SG&A Expenses per dollar investment in stock	-16036	(2929)[a]	-21165	(2834)[a]
Inventory[2]				
Grocery firms	-2203	(1041)[b]		
Non-grocery firms	-1360	(662)[b]		
Total Assets[2]				
Grocery firms			-493	(211)[b]
Non-grocery firms			-1726	(373)[a]

[a] significant at 0.01
[b] significant at 0.05

[1] F-tests for both models are significant at 0.01. The figures in brackets give standard errors of estimates.
[2] Because of the small number of data points, we did not estimate separate coefficients for all industry segments. We included convenience stores and grocery stores in the first group, and all remaining firms in the second group, since these had the widest separation between their inventory turns and asset turns values.

Table 6: Test for the Interrelationship between Inventory Turns and Gross Margin

Model equation: $\log IT_i = \alpha_s + \beta \log GM_i + \varepsilon_i$

where $\log IT_i$ is the log of average inventory turns for firm i, $\log GM_i$ is the log of average gross margin for firm i, and α_s is an industry specific intercept.

	Results for all firms with at least 5 years of data	Results for all firms with at least 10 years of data
Number of firms	157	80
Number of retail segments	14	11
R-square	0.638	0.640
F-test for significance of industry specific intercept	10.51[a]	7.01[a]
Estimated coefficient of log GM (standard errors in parentheses)	-0.530 (0.126)[a]	-0.474 (0.207)[a]

[a] significant at 0.0001

Table 7: Test for the Interrelationship between Gross Margin and SG&A Expenses

Model equation: $GM_i = \alpha + \beta\ SGA_i + \varepsilon_i$

where GM_i and SGA_i are expressed as percent of sales. They denote average values of gross margin and SGA for firm i over time. Segment specific intercept was not required because industry effect was negligible.

	Results for all healthy firms with 10 years of data (1988 to 1997)	Results for all healthy firms for 1997
Number of firms	82	158
R-square	0.822	0.743
Intercept (standard errors in parentheses)	8.10 (1.28)[a]	9.02 (1.20)[a]
Estimated coefficient of SGA (standard errors in parentheses)	0.96 (0.050)[a]	0.94 (0.044)[a]

[a] significant at 0.01

Table 8: Results for the estimation of declining trend in sales growth rate over time

$$g_{it} = a_i + b\ t + e_{it}$$

Number of firms	185
Number of data points	2305
R-square	0.322
F-value for the model	5.44 (significant at 0.0001)
Estimated coefficient of time, β	-0.997 (standard error = 0.0996)

Table 9: Estimation of sales growth rates and fixed assets growth rates of healthy firms and firms that filed for bankruptcy (in the years preceding bankruptcy)

	Number of firms	Average and Standard Error of Sales Growth Rate (%)	Average and Standard Error of Fixed Assets Growth Rate (%)
Annual average for healthy firms	174	13.92 (2.31)	17.29 (0.70)
4 years before bankruptcy	27	7.38 (2.09)	9.39 (3.68)
3 years	29	3.22 (1.96)[b]	10.94 (5.05)
2 years	29	7.72 (4.44)	14.32 (7.20)
1 year	30	0.67 (5.61)[b]	2.67 (4.41)
During the year of bankruptcy	33	-12.43 (2.85)[a]	-15.39 (3.58)

[a] Sales growth rate of a bankrupt firm is less than the sales growth rate of a healthy firm with $p \leq 0.01$
[b] Sales growth rate of a bankrupt firm is less than the sales growth rate of a healthy firm with $p \leq 0.05$