Growth and Value: Past growth, predicted growth and fundamental growth

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June 2008

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A key input, when valuing businesses, is the expected growth rate in earnings and cash flows. Allowing for a higher growth rate in earnings usually translates into higher value for a firm. But why do some firms grow faster than others? In other words, where does growth come from? In this paper, we argue that growth is not an exogenous input subject to the whims and fancies of individual analysts, but has to be earned by firms. In particular, we trace earnings growth back to two forces: investment in new assets, also called sustainable growth, and improving efficiency on existing assets, which we term efficiency growth. We use this decomposition of growth to examine both historical growth rates in earnings across firms and the link between value and growth. We close the paper by noting that the relationship between growth and value is far more nuanced than most analysts assume, with some firms adding value as they grow, some staying in place and some destroying value.

Growth is a central input in the valuation of businesses. In discounted cash flow models, it is the driver of future cash flows and by extension the value of these cash flows. In relative valuation, it is often the justification that is offered for why we should pay higher multiples of earnings or book value for some firms than for others. Given its centrality in valuation, it is surprising how ad hoc the estimation of growth is in many valuations and how little we know about its history, origins and relationship to value.

Growth as a Valuation Input

We begin this paper by looking at how growth plays a role in both discounted cash flow valuation and relative valuation. In the former, it is an explicit input that is key to determining value. In the latter, it is more often a subjective component used to explain why some companies should trade at higher value (or multiples) than others.
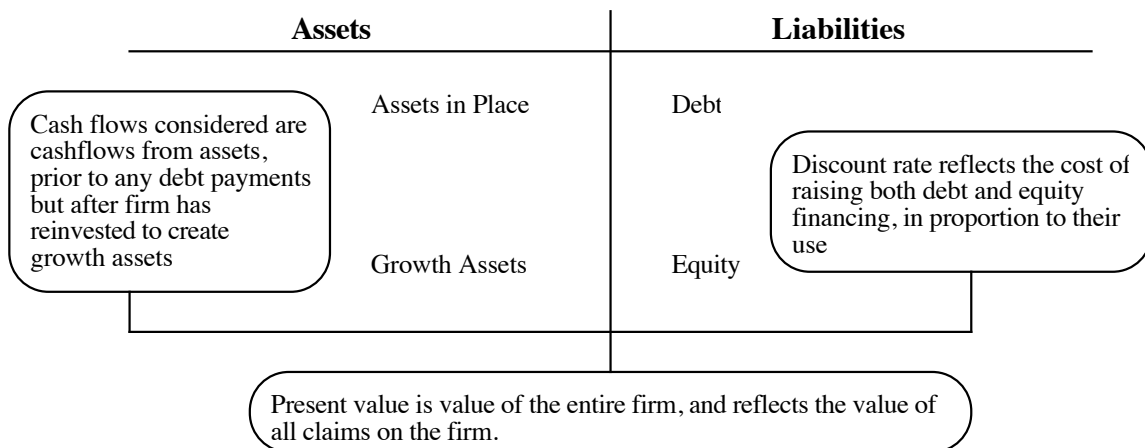
Discounted Cash flow Valuation

In a discounted cash flow framework, the value of an asset or business is the present value of the expected cash flows generated by that asset (business) over time. When valuing a business, these expected cash flows are usually generated from estimated earnings in future periods, which, in turn, are determined by current earnings and the expected growth rate in these earnings. Thus, the value of a business is a function of the expected earnings growth rate, though, as we will see later in this paper, the relationship is neither as simple nor as obvious as it looks at first sight.

DCF Valuation Approaches

There are two ways in which we can approach discounted cash flow valuation. The first is to value the entire business, with both assets-in-place and growth assets; this is often termed firm or enterprise valuation.
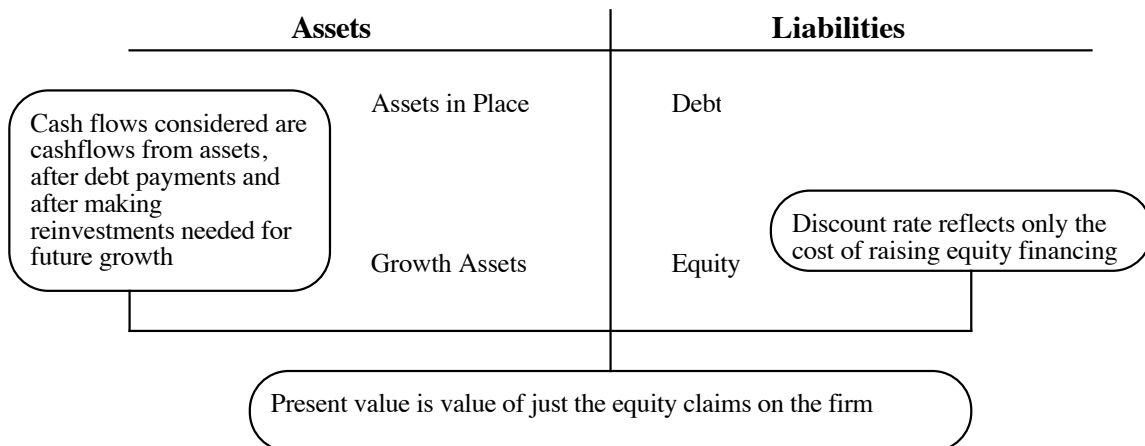
Firm Valuation

Assets	Liabilities

Assets in Place   Debt

Growth Assets   Equity

Cash flows considered are cashflows from assets, prior to any debt payments but after firm has reinvested to create growth assets

Discount rate reflects the cost of raising both debt and equity financing, in proportion to their use

Present value is value of the entire firm, and reflects the value of all claims on the firm.

The cash flows before debt payments and after reinvestment needs are called <u>free cash flows to the firm</u>, and the discount rate that reflects the composite cost of financing from all sources of capital is called the <u>cost of capital</u>.

The second way is to just value the equity stake in the business, and this is called equity valuation.

Equity Valuation

Assets	Liabilities

Assets in Place   Debt

Growth Assets   Equity

Cash flows considered are cashflows from assets, after debt payments and after making reinvestments needed for future growth

Discount rate reflects only the cost of raising equity financing

Present value is value of just the equity claims on the firm

The cash flows after debt payments and reinvestment needs are called free cash flows to equity, and the discount rate that reflects just the cost of equity financing is the cost of equity. Note also that we can always get from the former (firm value) to the latter (equity value) by netting out the value of all non-equity claims from firm value. Done right, the value of equity should be the same whether it is valued directly (by discounting cash flows to equity a the cost of equity) or indirectly (by valuing the firm and subtracting out

the value of all non-equity claims). We will return to discuss this proposition in far more detail in a later chapter.

Earnings Growth in Equity Valuation Models

When valuing equity investments in publicly traded companies, it can be argued that the only cash flows that investors get from the firm are dividends. Therefore, the value of the equity in these investments can be computed as the present value of expected dividend payments on the equity.

$$\text{Value of Equity (Only Dividends)} = \sum_{t=1}^{t=\infty} \frac{E(\text{Dividend}_t)}{(1+k_e)^t}$$

where k_e is the cost of equity and $E(\text{Dividend}_t)$ is the expected dividend in time period t. To use this model, we would need to make estimates of expected dividends in future years, and the importance of growth becomes apparent. In the simplest version, the value of equity will be a function of expected dividend growth ($g_{dividends}$) in the future:

$$\text{Value of Equity} = \sum_{t=1}^{t=\infty} \frac{\text{Dividends}_{\text{Current}}(1+g_{dividends})^t}{(1+k_e)^t}$$

Here, the relationship between growth and the value of equity seems trivial – higher dividend growth translates into higher equity value. Dividends are paid out of earnings, though, and this equation can therefore be rewritten as a function of earnings growth rates and the proportion of earnings paid out as dividends (payout ratios) in the future:

$$\text{Value of Equity} = \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_{\text{Current}}(1+g_{\text{Net Income}})^t(\text{Payout ratio})_t}{(1+k_e)^t}$$

The relationship between growth and value is more subtle in this expanded version of the model. Higher earnings growth, holding all else equal (payout ratio and cost of equity), translates into higher equity value. However, if higher earnings growth is accompanied by lower payout ratios and/or higher risk (cost of equity), it is conceivable that it could lead to lower value.

To the extent that the actual dividends paid may not be a good measure of what a company can afford to pay, there is a rationale for focusing on potential dividends – cash

available for dividends after taxes, reinvestment needs and debt payments have been made. The free cash flow to equity provides such a measure:

Free Cash Flow to Equity (FCFE) = Net Income – Reinvestment Needs – (Debt Repaid – New Debt Issued)

Reinvestment needs include investments in long-term assets (measured as the difference between capital expenditures and depreciation) and in short term assets (captured in the change in non-cash working capital). The modified version of the value of equity, using potential dividends, can be written as follows:

$$\text{Value of Equity} = \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_{\text{Current}}\,(1+g_{\text{Net Income}})^t (1 - \text{Equity Reinvestment Rate})_t}{(1+k_e)^t}$$

where the equity reinvestment rate (ERR) is the reinvestment, net of debt cash flows, computed as a percent of net income:

$$\text{ERR} = \frac{\text{Cap Ex - Depreciation} + \Delta\text{Working Capital - (New Debt Issued - Debt repaid)}}{\text{Net Income}}$$

Here again, there is a trade off on growth. Higher earnings growth, holding equity reinvestment rates and the costs of equity constant, result in higher equity value. Higher earnings growth accompanied by higher reinvestment and/or more risk can result in lost value.

Earnings Growth in Firm Valuation Models

When valuing a business, we discount cash flows prior to debt payments but after taxes and reinvestment needs back at the weighted average of the costs of equity and debt (cost of capital):

$$\text{Value of Firm} = \sum_{t=1}^{t=\infty} \frac{E(\text{Free Cash Flow to the Firm}_t)}{(1+k_c)^t}$$

where k_c is the cost of capital and the free cash flow to the firm (FCFF) is the cash flow left over after taxes and reinvestment needs. As with cash flows to equity, the cash flows to the firm can be written as a function of earnings and reinvestment, with two key differences. The first is that the earnings that we consider are after-tax operating income (rather than net income). The second is that the reinvestment is the total reinvestment, rather than just the equity component, and it is scaled to the after-tax operating income.

Free Cash flow to Firm (FCFF) = After-tax Operating income - (Capital Expenditures – Depreciation) - Δ Working Capital

$$\text{Value of Firm} = \sum_{t=1}^{t=\infty} \frac{\text{After - tax Operating income}_{\text{Current}}(1+g_{\text{AT OI}})^t(1-\text{ Reinvestment Rate})_t}{(1+k_c)^t}$$

where $g_{\text{AT OI}}$ is the growth rate in after-tax operating income and the reinvestment rate is defined as follows:

$$\text{Reinvestment Rate} = \frac{\text{Cap Ex - Depreciation + } \Delta\text{Working Capital}}{\text{After - tax Operating Income}}$$

Higher expected growth in after-tax operating income will increase the value of a business, if you hold the reinvestment rate and cost of capital fixed. However, increasing growth by increasing reinvestment and/or raising the cost of capital (by entering risky businesses) may decrease the value of a firm.

Relative Valuation

In intrinsic valuation the objective is to find assets that are priced below what they should be, given their cash flow, growth and risk characteristics. In relative valuation, the philosophical focus is on finding assets that are cheap or expensive relative to how "similar" assets are being priced by the market right now. In the context of valuing equities, this usually takes the form of a multiple (PE, EV/EBITDA) that is compared across firms that are viewed as being similar, usually because they operate in the same business. While growth does not play as explicit a role in relative valuation as it does in discounted cash flow valuation, it plays a critical role in the background. In fact, there are three ways in which growth is incorporated into relative valuation – on a subjective basis when comparisons are made, by incorporating expected growth into the multiple or statistically in a regression.

Growth as a story

In most relative valuations, analysts consider the impact of growth when comparing how companies are priced, but they do so subjectively to come to a variety of conclusions. In its most benign form, differences in growth are used to explain why companies within a sector trade at different multiples of earnings: low (high) growth companies trade at low (high) earning multiples. In its activist form, differences in

growth are also used to explain why some stocks are bargains, because they trade at low multiples of earnings with high expected earning growth rates. In its final and potentially most dangerous form, analysts justify buying stocks that trade at high multiples of earnings, relative to the industry average, because their high growth justifies the price (at least according to the analyst).

While story telling about growth is pervasive in relative valuation, it can also be dangerous for three reasons. First, while higher growth should be (and usually is) correlated with higher earnings multiples, there are other factors that intervene – higher risk and the quality of growth are two factors that come to mind. In fact, as we will see in the following sections, it is entirely possible for higher growth to result in lower earnings multiples. Second, the nature of subjective comparisons is that the final conclusion is in the eyes of the beholders. In other words, what seems like a reasonable multiple of earnings, given a growth rate, for a bullish analyst may seem too high to a bearish analyst. Third, and as a related point, the nature of this storytelling process is that analysts back into values (and conclusions) that they had prior to the analyses. In other words, absent an objective standard, it becomes easy for analysts to rationalize their prior views on a stock.

Growth-adjusted Multiples

If relative valuation is centered on earnings multiples and growth is a key element explaining multiples, it is a logical extension to incorporate growth directly into the multiple, rather than discuss it after the comparison. With price earnings ratios in particular, there are two variants that have emerged that combine earnings multiples with expected growth rates in a composite measure.

In the first, price earnings ratios are compared to expected growth rates in earnings, with stocks trading at PE ratios that are lower than the expected growth rate in earnings being viewed as cheap. Thus, a stock with an expected growth rate in earning per share of 25% would be viewed as cheap if it traded at 22 times earnings, whereas a stock with an expected growth rate of 10% would be viewed as expensive at 8 times earnings. The problem with this approach is two fold. The first is that the level of interest rates can play a significant role in how many stocks look cheap based on this comparison,

with more (fewer) stocks trading at PE ratios below their expected growth rates when interest rates are high (low). The second is that it does not control for risk: riskier stocks should trade at lower multiples of earnings, for any given growth rate. Not surprisingly, using this approach to find undervalued stocks can yield a disproportionately large number of risky stocks.

In the second, the price earnings ratio is divided by the expected growth rate to come up with a PEG ratio:

PEG = PE/ Expected growth rate in earnings per share

For example, the PEG ratio for a firm with a PE ratio of 20 and an expected growth rate in earnings per share of 15% would be 1.33 (20/15). In a sense, a PEG ratio is a growth-adjusted variant of the PE ratio, with low PEG ratios indicating undervalued stocks. While PEG ratios are widely used by analysts to screen and value high growth companies, the comparison is based upon the assumption that the PE ratio increases linearly with growth. Thus, as the expected growth rate in earnings doubles, we are assuming that PE ratios double. To the extent that the relationship between growth and PE is not linear, it is possible that firms that look under valued on a PEG ratio basis, because they have high growth rates and low PEG ratios, are fairly valued. In addition, it suffers from the same failure to incorporate risk as the simpler PE/growth comparison; riskier firms should trade at lower PEG ratios than safer firms.

Statistical Practices

If we accept the premise that PE ratios are higher for companies with higher growth rates in earnings, and are uncomfortable with the subjectivity of the story telling approach and the rigidity of PEG ratios, there is an intermediate solution. We could let the market tell us how much it values growth by looking at how PE ratios vary across companies, in a sector or even across the market, as expected growth rates vary. In other words, if growth at a reasonable price is the mantra that drives investing, letting the market tell us the right price for growth seems to be a logical solution.

To put this into practice, we begin with the observed earnings multiples of publicly traded companies and relate them to the expected growth rates in earnings. In its

simplest statistical form, this would require us to run a simple regression of earnings multiples against expected earnings growth rates:

PE = a + b (Earnings growth rate)

However, this regression can be expanded to incorporate the other variables that determine value including risk and cash flows. In the context of PE, this usually implies bringing in the beta (risk) and payout (cashflow) into the regression:

PE = a + b (Earnings growth) + c (Beta) + d (Payout ratio)

This regression can be run across the firms within a sector or even across the entire market. One of the earliest regressions of PE ratios against fundamentals was done by Kisor and Whitbeck in 1963.[1] Using data from the Bank of New York as of June 1962 for 135 stocks, they arrived at the following regression.

P/E = 8.2 + 1.5 (Growth rate in Earnings) + 6.7 (Payout ratio) - 0.2 (Standard Deviation in EPS changes)

In other words, a 1% difference in growth rates, in this sample, translated into an increase of 1.5 in the PE ratio, Cragg and Malkiel followed up in 1968 by estimating the coefficients for a regression of the price-earnings ratio on the growth rate, the payout ratio and the beta for stocks for the time period from 1961 to 1965.[2] Damodaran (2002, 2006) has updated versions of these regressions for US stocks as well as for foreign listings.[3]

The first advantage of this approach over the "subjective" comparison across firms in the same sector described in the previous section is that it does quantify, based upon actual market data, the degree to which higher growth or risk should affect the multiples. It is true that these estimates can be noisy (i.e, they have high standard error), but this noise is a reflection of the reality that many analysts choose not to face when they make subjective judgments. It is also true that they are based on the assumption that the relationship between PE and these variables is linear but that can remedied fairly simply by running non-linear regressions. Second, by looking at all firms in the market, it allows

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[1] Whitbeck, V. and M.Kisor, 1963, "A new tool in investment decision making", Financial Analysts Journal, Vol. May/June pp.55-62.

[2] Cragg, L. and B. Malkiel, 1968, "The Consensus and Accuracy of Some Predictions of the Growth of Corporate Earnings," Journal of Finance 23, 67-84.

[3] Damodaran, A., 2002, Investment Valuation, John Wiley and Sons; Damodaran, A., 2006, Damodaran on Valuation, John Wiley and Sons.

analysts operating in sectors with relatively few firms in them to make more powerful comparisons. Finally, it gets analysts past the tunnel vision induced by comparing firms within a sector, when the entire sector may be under or over valued.

Historical Growth

When trying to estimate expected earnings growth, it is natural that we start by looking backwards – at historical or past earnings growth. But is past growth a good predictor of future growth? If not, what can we learn by looking at the past? In this section, we look at past earnings growth, with the intent of drawing lessons for forecasting future growth. We begin by looking at differences in growth rates across different measures of earnings from operating income to earnings per share and why these differences exist. Next, we estimate differences in growth rates across publicly traded companies and examine the reasons for these differences. Third, we look at earnings growth rates across time, both for individual firms and for the market, to see how much persistence there is in growth rates, a key factor in whether past growth rates can be used for forecasting future growth.

Growth across measures

The accounting earnings for a firm can be measured in multiple ways. In a typical accounting statement, there are at least four widely used earnings measures – earnings before interest, taxes and depreciation (EBITDA), operating income or earnings before interest and taxes, net income and earnings per share. Within each of these measures, there are sub-measures: for instance, net income can be computed before or after extraordinary items and earnings per share can be computed based on primary shares outstanding or on a fully diluted basis. In addition, management consultants and data services have derived their own "improved" measures of earnings, where they adjust earnings for leases, R&D and pension funds. Given all of these different measures of earnings, it is not surprising that we mix them up and assume that growth in one measure is growth in the others as well. For instance, it is not uncommon to see the growth rate in earnings per share used as the growth rate in operating income, in discounted cash flow valuations.

In reality, growth rates vary across earnings measures for the same firm over the same time period. To illustrate this point, we estimated the growth rates in revenues and earnings measures for publicly traded companies in the US for two five-year time periods – 1997-02 and 2002-07 - and report the key statistics in table 1:[4]

Table 1: Growth Rates in Revenues & Earnings: US companies from 2003-2007

	1997 - 2002					2002 - 2007				
	Revenues	*EBITDA*	*EBIT*	*Net Income*	*EPS*	*Revenues*	*EBITDA*	*EBIT*	*Net Income*	*EPS*
Mean	9.56%	7.65%	5.46%	7.04%	8.48%	10.67%	15.80%	11.38%	11.32%	18.22%
Standard Error	0.38%	0.49%	0.48%	0.53%	0.51%	0.40%	0.46%	0.64%	0.68%	0.68%
Median	7.32%	6.38%	3.90%	6.54%	6.73%	10.76%	13.63%	12.09%	12.50%	19.17%
Standard Deviation	23.09%	23.01%	22.96%	24.98%	23.55%	27.72%	24.48%	33.53%	34.71%	34.40%
Sample Variance	5.33%	5.29%	5.27%	6.24%	5.55%	7.68%	5.99%	11.24%	12.05%	11.83%
# Firms	3764	2235	2265	2212	2168	4877	2785	2771	2631	2557

Note the wide differences in growth rates over the different measures, with revenue growth outstripping growth in earnings measures in the 1997-2002 time period, whereas the earnings measures grew faster than revenues in the 2002-2007 time period.

There are a number of reasons why growth rates are different across different measures of earnings and why earnings growth rates diverge from revenue growth rates:

1. Changes in operating performance: The operating income is a function of both revenues and operating margins. To the extent that margins improve or deteriorate over time, operating income can chart a different path from revenues. This may explain the differences in growth across the two time periods. The first period (1997-2002) included much of the dot-com bubble and the economic recession in the last two years of the period; the latter reduced profitability and margins at many companies. The second period was a period of improving profitability, reflected in higher margins and improved earnings.

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[4] The data for these estimates was obtained from Capital IQ. There are about 6200 publicly traded firms in this sample.

2. Operating leverage: The sensitivity of operating income to changes in revenues is a function of the proportion of the costs that are fixed costs. With high fixed costs or operating leverage, small changes in revenues can translate into large changes in operating income.

3. Financial leverage: Just as fixed operating costs can make operating income more sensitive to changes in revenues, high financial leverage and the resulting fixed cost of interest expenses can make equity earnings (net income and earnings per share) more sensitive to changes in operating income.

4. Dividend policy: If the number of shares outstanding remained constant over time, changes in net income and changes in earnings per share should match. To the extent that firms buy back (issue) shares, the earnings per share growth will be higher (lower) than net income growth. The shift from conventional dividends to stock buybacks at U.S. companies in the last decade has been widely documented. Not surprisingly, the earnings per share growth is higher than net income growth in both periods.

5. Noise variables: The net income for a firm included income and expense items that are not part of the operating income computation. In particular, income from cash, marketable securities and minority holdings in other companies are reported as part of net income but are not part of operating income. If these items are volatile, net income growth can deviate from operating income growth.

The differences are summarized in table 2.

Table 2: Differences in Earnings Growth Rates

Item	Factors that explain differences
Revenues	
- Operating Expenses	1. Changes in operating efficiency/ performance 2. Operating leverage
EBITDA	
- Depreciation & Amortization	1. Changes in depreciation schedules/ rules 2. Amortization of intangibles
EBIT	
- Interest Expenses + Income from cash holdings - Taxes	1. Changes in financial leverage (debt) 2. Changes in cash holdings/ interest rates 3. Changes in tax rates/ rules
Net Income	

/ Number of Shares	1. Stock buybacks and issues 2. Exercise of past option grants
Earnings per share	

These differences also point to how we should approach estimating growth for the future.

Proposition 1: Generally speaking, growth rates for firms will tend to decrease as you move up the income statement. In other words, earnings per share growth rates will be higher than net income growth rates and net income will grow faster than operating income.

Proposition 2: The level of detail in a forecast will have to increase if you expect changes in operating efficiency, operating leverage, financial leverage and/or dividend policy. In other words, you can forecast just earnings per share for a company with stable operating performance, operating and financial leverage and a fixed dividend policy. For this company, revenues and the different earnings measures will grow at the same rate. If you expect changes in operating performance, leverage and dividend policy over time, you have to forecast revenues, margins and net income each year based upon these changes. For this firm, the growth rates will be different for different measures as you move down the income statement.

Growth across companies

At the risk of stating the obvious, valuation is complicated because earnings growth rates vary across companies. At one end of the spectrum are companies on the fast growth track, where earnings grow at double digit or even triple digit levels. At the other end are firms in decline, where earnings are either negative or declining. In a diverse economy like the United States, the differences in growth rates across companies can be very large over the same time period.

In table 3, we consider differences in earnings growth rates across sectors in the United States for the 1997-02 and 2002-07 time periods.

Table 3: Growth Rates by Sector: 1997-2002 and 2002-07

Primary Sector	Number of firms	Revenue growth: 97-02	Revenue Growth: 03-07	EBITDA Growth: 97-02	EBITDA: 03-07	EBIT Growth: 97-02	EBIT Growth: 03-07	Net Income Growth: 97-02	Net Income Growth: 03-07

Consumer Discretionary	758	12.47%	10.21%	12.07%	7.83%	11.09%	7.88%	12.17%	10.63%
Consumer Staples	207	7.03%	9.88%	6.92%	9.70%	7.48%	10.38%	7.73%	14.01%
Energy	401	12.87%	27.71%	10.31%	33.90%	5.39%	34.98%	5.41%	37.41%
Financials	2038	8.07%	1.63%	7.87%	18.00%	1.72%	-7.64%	7.18%	-1.81%
Healthcare	759	14.65%	12.92%	16.83%	15.12%	18.76%	13.41%	19.03%	13.35%
Industrials	673	6.52%	13.30%	4.08%	16.59%	1.14%	18.33%	1.85%	19.28%
Information Technology	967	11.31%	15.33%	1.89%	17.78%	2.66%	21.78%	4.19%	23.18%
Materials	300	-1.81%	13.62%	1.56%	18.85%	-1.51%	21.72%	-5.10%	27.94%
Telecommunication Services	122	14.87%	15.15%	11.93%	14.20%	4.51%	17.84%	2.39%	20.90%
Utilities	130	8.44%	9.61%	6.15%	8.36%	6.86%	9.51%	6.46%	11.64%
Market	6500	9.56%	10.67%	7.65%	15.80%	5.46%	11.38%	7.04%	11.32%

Why are there differences across sectors? Some are related to where the sector is in terms of its life cycle, with younger sectors delivering higher earnings growth. Others are a function of competition within sectors, with firms in less competitive sectors being able to deliver higher earnings growth for any given level of revenue growth than firms in more competitive sectors. Finally, the differences in growth rates can be traced to broader macro economic movements. For instance, the high earnings growth rate delivered by energy and material companies during the 2002-2007 time period can be traced to rising oil and commodity prices over the same period. For a more detailed look at growth rates by industry (rather than sector), refer to table A at the end of the paper.

In table 4, we categorize firms based upon size (using the level of revenues at the start of each five year period as the categorization variable) and examine growth rates in earnings measures for each size class:

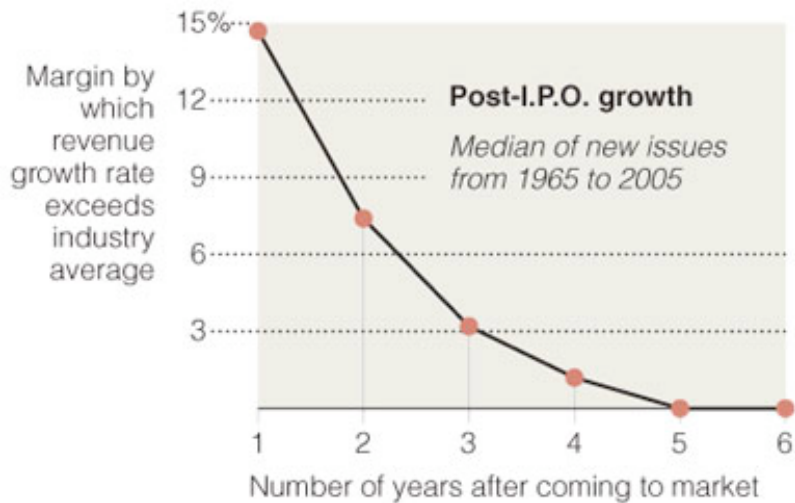*Table 4: Growth Rates classified by firm size*

Size Class	Growth rates from 1997 - 2002				Growth rates from 2002 - 2007			
	Revenue	EBITDA	EBIT	Net Income	Revenue	EBITDA	EBIT	Net Income
Smallest	11.63%	12.58%	4.95%	7.17%	9.13%	22.59%	-3.83%	-3.96%
2	11.39%	14.11%	10.18%	11.01%	10.88%	19.73%	10.82%	7.52%
3	9.75%	9.11%	8.02%	7.43%	12.01%	19.47%	17.59%	15.33%
4	9.13%	6.16%	5.63%	7.62%	12.38%	15.53%	16.85%	17.78%
5	8.10%	6.24%	5.45%	6.15%	12.41%	13.41%	15.99%	17.28%
6	6.80%	5.67%	4.32%	6.73%	10.90%	13.84%	16.66%	19.73%
7	4.51%	1.49%	2.19%	3.00%	12.11%	12.59%	14.60%	20.81%
Largest	4.81%	2.71%	2.77%	4.38%	9.36%	10.73%	13.60%	20.96%
Market	9.56%	7.65%	5.46%	7.04%	10.67%	15.80%	11.38%	11.32%

During the 1997-2002 time period, the pattern on revenues and earnings is fairly straightforward. As firms get larger, revenues and earnings grow at lower rates, a phenomenon that can be attributed to two factors. The first is that delivering high growth rates becomes more difficult at higher levels of income (revenue) than at lower levels. The second is that success attracts competition and larger firms that are successful attract more competition than smaller firms. However, the numbers from 2002 to 2007 indicate the volatility of the relationship between size and growth, with EBITDA growth decreasing, but operating and net income growth increasing as firms get larger.

In a more controlled test of how growth changes as firms get larger, Metrick (2006) examined the growth rate in revenues for firms, relative to growth rate in revenues for the sector in which they operate, in the immediate aftermath of their initial public offerings.[5] The results are reported in Figure 1 below:

Figure 1: Revenue growth in years after initial public offering

Typically, the revenue growth rate of a newly public company outpaces its industry average for only about five years.

Margin by which revenue growth rate exceeds industry average

Post-I.P.O. growth

Median of new issues from 1965 to 2005

Number of years after coming to market

Source: Andrew Metrick   The New York Times

Note how quickly the revenue growth at these high growth firms moves towards the industry average – from a 15% higher revenue growth (then the industry average) one

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[5] Metrick, A., 2006, Venture Capital and the Finance of Innovation, John Wiley & Sons.

year after the IPO to 7% higher in year 2 to 1% higher in year 4 to the industry average in year 5.

Proposition 3: Scaling up is hard to do. The expected growth rate for a firm should be tied to the size of the firm, with growth rates decreasing as the firm gets larger.

Growth across time

In an article titled "Higgledy Piggledy Growth", I. M. D. Little examined whether British companies that reported high earnings growth in one five-year period continued to exhibit that growth in the next five-year period and concluded that there was no relationship between growth in the two periods.[6] In 1966, Little returned to the question in an article "*Higgledy Piggledy Growth Again*" with co-author A. C. Rayner.[7] This time they controlled for industry differences and found again that earnings growth leaders within an industry from 1952 to 1956 did not have a better chance than other industry participants to be leaders in growth from 1957 to 1961. In 1967, Lintner and Glauber presented "*Higgledy Piggledy Growth in America*" which echoed the British observations using U.S. stocks.[8]

In a more recent study of earnings growth persistence, Chan, Lakonishok and Karceski (2003) tested for persistence and predictability in growth rates by looking at earnings at U.S. firms from 1951 to 1997.[9] They concluded that the median growth rate in earnings across firms corresponds closely to growth in Gross Domestic Product (GDP), high growth was uncommon and that there was no persistence in earnings growth beyond chance. However, they do find some persistence, albeit small, in revenue growth at firms. Building on the persistence theme, Hall and Tochterman (2006) examined revenue and earnings growth at Australian firms from 1989 and 2006 and find evidence that a firm reporting growth above the industry average one year has a close to two-thirds

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[6] Little, I.M.D. 1962, 'Higgledy piggledy growth', *Oxford Bulletin of Statistics*, vol. 24, no. 4, pp. 387–412.

[7] Rayner, A.C. and I.M.D. Little, 1966, Higgledy Piggledy Growth Again, Basil Blackwell.

[8] Lintner, J., and R. Glauber, 1967, Higgledy, piggledy growth in America, presented to the Seminar on the Analysis of Security Prices, University of Chicago, May 1967, reprinted in: J. Lorie and R. Brealey, eds., 1978, Modern developments in investment management, 2nd ed. (Dryden, Hinsdale).

[9] Chan, L.K.C, J. Karceski and J. Lakonishok, 2003, The Level and Persistence of Growth Rates, Journal of Finance, v58. 643-684.

chance of repeating that performance in the following year, though they note a decay for longer time periods.[10]

While it is not our objective to replicate either of these studies, we estimated growth rates in net income in two five-year periods – 1998 to 2002 and 2003 to 2007 – for publicly traded U.S. companies and categorized them into six growth groups in each period. In table 5, we summarize the persistence of growth by looking at how companies classified on earnings growth in the first period ranked in the subsequent period.

Table 5: Net Income Growth Persistence

		2002- 2007					
	Growth Class	*Lowest*	*2*	*3*	*4*	*5*	*Highest*
1997- 2002	Lowest	13.73%	7.19%	7.52%	9.80%	13.07%	48.69%
	2	27.27%	6.74%	12.61%	15.84%	17.01%	20.53%
	3	15.23%	14.09%	27.27%	20.45%	11.14%	11.82%
	4	10.03%	14.09%	34.15%	21.14%	11.38%	9.21%
	5	9.09%	12.63%	24.24%	28.79%	12.12%	13.13%
	Highest	16.32%	10.88%	19.67%	22.18%	13.81%	17.15%

For the most part, there is no evidence of persistence. For instance, of the firms that delivered the highest growth between 1997 and 2002, only 17.15% remained in the highest growth class for the 2002-07 time period, not significantly different from the 16.67% you would expect to observe with a completely random process. The only group where randomness did not rule was the lowest growth group from 1997-2002, where a disproportionately large proportion (48.69%) moved into the highest growth category in the 2002-07 time period.

To examine whether past growth is more useful for some measures than others and for some firms more than others, we computed the correlation in the two five-year growth rates on a variety of measures based upon size class in table 6.

Table 6: Correlations in Growth: Size Classes

	Revenues	EBITDA	EBIT	Net Income	EPS
Smallest	0.078	-0.071	-0.018	0.000	-0.068
2	0.063	-0.117	-0.265	-0.314	-0.338
3	0.034	-0.257	-0.233	-0.200	-0.325
4	-0.022	-0.182	-0.302	-0.271	-0.355

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[10] Hall, J. and M. Tochterman, 2006, Persistence in Growth versus Market Expectations, Working Paper, SSRN.com.

5	0.048	-0.256	-0.411	-0.324	-0.404
6	-0.004	-0.173	-0.278	-0.372	-0.354
7	-0.121	-0.425	-0.333	-0.506	-0.509
Largest	0.158	-0.230	-0.290	-0.523	-0.550
All firms	0.066	-0.153	-0.228	-0.111	-0.298

Revenue growth rates exhibit mild positive correlation, especially for the firms at the either end of the size spectrum, but there is negative correlation on every measure of earnings. Put more starkly, at least over the two time periods that we examined, firms with high growth rates in earnings in one period are more likely to be underperformers when it comes to growth in the next period. In addition, the negative correlation in earnings growth is much greater for larger firms than for smaller firms.

Proposition 4: There is little predictive value in historical growth rates and high growth rates in the past are not indicative of high growth rates in the future. To the extent that there is predictability, revenue growth is a little more persistent than earnings growth and periods of high earnings growth are more likely to be followed by low than high earnings growth.

How good are growth forecasts?

Historical growth rates in earnings are, by definition, backward looking, but the focus in investing is on expected future growth. With publicly traded firms, these forecasts of growth are provided and updated at regular intervals by equity research analysts following the firm. Given the high profiles given these forecasts, we begin this section by looking at the quality of analyst forecasts of earnings growth. With most firms, private and public, managers sometimes provide their own forecasts of earnings (and growth) in the future. While these forecasts are undoubtedly biased, they do incorporate the superior information that managers bring to the table and presumably should be superior estimates and we examine whether they are. Finally, for publicly traded firms, the market price provides an implicit estimate of the expected growth in earnings in the future. To proponents of market efficiency, there should be information in these implied earnings growth rates.

1. Equity Research Analysts

For publicly traded firms, the most common source of expected earnings growth rates is the equity research analysts who follow the firm. Earnings growth estimates, and updates to these estimates, are widely disseminated by the financial press and are often propagated as the reason for major stock price movements. In this section, we will begin by looking first at the types of firms that equity research analysts follow and the nature of these forecasts. We will then examine the quality of these forecasts and whether there is any information to be gleaned from these forecasts.

Analyst Forecasts – The Big Picture

In January 2008, equity research analysts tracked almost 3000 publicly traded firms in the United States and thousands more in foreign markets. Analysts tend to follow larger market capitalization companies, but liquidity and institutional interest play a role as well. Companies that are more liquid and have significant institutional holdings are more likely to be tracked by analysts.

While the primary job of an equity research analyst is to make buy and sell recommendations on the stocks that they cover, a key component of what analysts is do is to make estimates of future earnings (and by extension, earnings growth) at the companies that they track. While there is little tangible research on how much of an analyst's day is spent on earnings estimates, much of the information they disseminate is centered around these numbers. Looking at the earnings forecasts themselves, there are some broad patterns that emerge:

1. While analysts estimate growth in revenues, operating income and equity earnings, the most common measure that they <u>focus on is earnings per share</u>. Thus, the consensus estimates of growth rates disseminated by services such as Zacks and I/B/E/S tend to be growth rates in earnings per share.

2. Analysts estimate growth in earnings for time periods ranging from the quarter ahead to five years forward. However, the number of estimates is greatest for the quarter ahead and decreases as the time horizon increases. In fact, in 2008, only 20% of analysts made estimates of long-term growth, whereas almost every analyst estimated one-quarter ahead earnings.

If the focus in valuation is not earnings in the next period but earnings growth over the long term and the measure of earnings is operating and not net income, the fact that analysts spend a disproportionate amount of time on short term growth in earnings per share should give us pause.

It is also worth noting that analysts constantly revisit their earnings estimates over time, and report updates to earnings, often with changes in recommendations. There is some research to indicate that the value added in equity research is not in recommendations, which are disproportionately skewed towards buy recommendations over sells, but in the revisions to earnings estimates. There are, however, two characteristics of earnings estimates from analysts that are worth highlighting. The first is that there is a <u>tendency towards herd behavior</u> – one analyst increasing his earnings estimate often leads to a flurry of other analysts doing the same.[11] The second is that there is some evidence of a <u>lagged effect</u>, in the sense that analysts tend to increase (lower) their estimates of earnings growth right after companies have reported better (worse)-than-expected earnings and that upgrades (downgrades) in earnings estimates in one period are followed by more upgrades (downgrades) in the following periods.

Are analysts good forecasters?

There are a number of reasons to believe that analyst forecasts of growth should be better than using historical growth rates.

- Analysts, in addition to using historical data, can use information that has come out about both the firm and the overall economy since the last earnings report, to make predictions about future growth. This information can sometimes lead to significant re-evaluation of the firm's expected cash flows.
- Analysts can also condition their growth estimates for a firm on information revealed by competitors on pricing policy and future growth. For instance, a negative earnings report by one telecommunications firm can lead to a reassessment of earnings for other telecommunication firms.

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[11] Scharfstein, D. and J. Stein. 1990. "Herd Behavior and Investment." American Economic Review 80: 465-479.

- Analysts sometimes have access to private information about the firms they follow which may be relevant in forecasting future growth. This avoids answering the delicate question of when private information becomes illegal inside information. There is no doubt, however, that good private information can lead to significantly better estimates of future growth. In an attempt to restrict this type of information leakage, the SEC issued Regulation FD in 2000 preventing firms from selectively revealing information to a few analysts or investors. Outside the United States, however, firms routinely convey private information to analysts following them.

- Models for forecasting earnings that depend entirely upon past earnings data may ignore other publicly available information that is useful in forecasting future earnings. It has been shown, for instance, that other financial variables such as earnings retention, profit margins and asset turnover are useful in predicting future growth. Analysts can incorporate information from these variables into their forecasts.

    If firms are followed by a large number of analysts and these analysts are indeed better informed than the rest of the market, the forecasts of growth that emerge from analysts should be better than estimates based upon either historical growth or other publicly available information. But is this presumption justified? Are analyst forecasts of growth superior to other forecasts?

    The general consensus from studies that have looked at short-term forecasts (one quarter ahead to four quarters ahead) of earnings is that analysts provide better forecasts of earnings than models that depend purely upon historical data. The mean relative absolute error, which measures the absolute difference between the actual earnings and the forecast for the next quarter, in percentage terms, is smaller for analyst forecasts than it is for forecasts based upon historical data. Two studies shed further light on the value of analysts' forecasts. Crichfield, Dyckman and Lakonishok (1978) examine the relative accuracy of forecasts in the Earnings Forecaster, a publication from Standard and Poors that summarizes forecasts of earnings from more than 50 investment firms. They measure the squared forecast errors by month of the year and compute the ratio of analyst forecast error to the forecast error from time-series models of earnings. They find that the time series models actually outperform analyst forecasts from April until August, but under perform them from September through January. They hypothesize that this is because

there is more firm-specific information available to analysts during the latter part of the year. The other study by O'Brien (1988) compares consensus analyst forecasts from the Institutions Brokers Estimate System (I/B/E/S) with time series forecasts from one quarter ahead to four quarters ahead. The analyst forecasts outperform the time series model for one-quarter ahead and two-quarter ahead forecasts, do as well as the time series model for three-quarter ahead forecasts and do worse than the time series model for four-quarter ahead forecasts. Thus, the advantage gained by analysts from firm-specific information seems to deteriorate as the time horizon for forecasting is extended.

In valuation, the focus is more on long-term growth rates in earnings than on next quarter's earnings. There is little evidence to suggest that analysts provide superior forecasts of earnings when the forecasts are over three or five years. The study by Cragg and Malkiel, referenced earlier, compared long term forecasts by five investment management firms in 1962 and 1963 with actual growth over the following three years to conclude that analysts were poor long term forecasters.[12] This view is contested by Vander Weide and Carleton (1988) who find that the consensus prediction of five-year growth in the I/B/E/S is superior to historically oriented growth measures in predicting future growth. Chan, Karceski and Lakonishok (2003), in a study we referenced earlier in the context of historical earnings growth, find that consensus estimates of long term growth from equity research analysts "are over optimistic and contribute very little to predicting realized growth over long time horizons."[13] There is an intuitive basis for arguing that analyst predictions of growth rates must be better than time-series or other historical-data based models simply because they use more information. The evidence indicates, however, that this superiority in forecasting is surprisingly small for long-term forecasts and that past growth rates play a significant role in determining analyst forecasts.

There is one final consideration. As we noted in the last section, analysts generally forecast earnings per share and most services report these estimates. When valuing a firm, you need forecasts of operating income and the growth in earnings per share will not be equal to the growth in operating income. In general, the growth rate in

[12] Cragg, J.G. and B.G. Malkiel, 1968, The Consensus and Accuracy of Some Predictions of Growth in Corporate Earnings, Journal of Finance, v13, 67-84.
[13] See earlier footnoe.

operating income should be lower than the growth rate in earnings per share. Thus, even if you decide to use analyst forecasts, you will have to adjust them down to reflect the need to forecast operating income growth.

Analyst forecasts may be useful in coming up with a predicted growth rate for a firm but there is a danger to blindly following consensus forecasts. Analysts often make significant errors in forecasting earnings, partly because they depend upon history and the same data sources (which might have been erroneous or misleading) and partly because they sometimes overlook significant shifts in the fundamental characteristics of the firm. The secret to successful valuation often lies in discovering inconsistencies between analysts' forecasts of growth and a firm's fundamentals.

Proposition 5: Analyst estimates of earnings (and growth) have some predictive value for short-term earnings forecasts, but are of little or any value for long-term growth forecasts.

II. Management

In many private businesses, managers make forecasts of future revenues, earnings and even cash flows for analysts and potential investors, often with the objective of attracting fresh capital. In publicly traded firms, management sometimes provides guidance to analysts following the firm, with the intent of influencing earnings forecasts.

As with equity research analysts, there are reasons to believe that managers should be better at forecasting earnings growth at their companies than others who follow the firm. First, managers do possess information about the inner workings of the firm – cash flows on projects, trends in inventory, profit margins on individual items - that are unavailable to outside investors.[14] Second, managers also control some of the levers that determine growth, since they are the ones who decide on how much new investment to make and in what areas. These advantages have to be weighed off against some potential costs. The first is that managers operate under legal constraints on what information they can reveal

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[14] As evidence that insiders (of which managers are a subgroup) possess superior information about future growth, consider the evidence that insider trading is correlated with future earnings growth. Ke, Huddart and Petroni find that insider selling picks up three to nine quarters before significant declines in earnings growth. (Bin Ke, Steven Huddart, and Kathy Petroni, "What insiders know about future earnings and how they use it: evidence from insider trades", Journal of Accounting & Economics, August 2003, 35:3, 315-346.)

and when they can divulge the information. As we noted earlier in the paper, at least in the United States, Regulation FD restricts managers from providing information that is not available to the broader market to subgroups of investors (such as analysts). The second is that there is a clear potential for bias, when managers are the source of news about their own firms. After all, managers have an incentive to present their firms (and by extension, themselves) in the best positive light. With private firms interested in raising capital, the forecasts of future growth will not only be optimistic but will be accompanied by equally optimistic estimates of the quality of the growth. With publicly traded firms, it is a more delicate dance, since markets react to earnings surprises – the differences between actual and expected earnings. It is conceivable that managers may try to talk down expectations about earnings, at least in the short term, so that they can deliver positive earnings surprises.

In a study of management guidance at publicly traded firms in 2005, Cotter, Tuna and Wysocki examined 1673 publicly traded firms between 1995 and 2001, with the intent of tracking management guidance offered to analysts.[15] Management provided guidance to analysts in about 17.6% of the observations in the sample, and the incidence of guidance actually increased after the passage of Regulation FD. Looking across the data, they concluded that:

1. Management is more likely to provide guidance when analysts are over optimistic than when they are over pessimistic. In other words, managers were more likely to intervene if analysts are over estimating expected earnings in the next period than if they are under estimating earnings.

2. Management is more likely to provide guidance when there is less disagreement (or more consensus) among analysts than when there is more disagreement.

3. Analysts quickly incorporate management guidance into their estimates, and the resulting numbers are more likely to be met or beat by the company. In this study, 47% of analysts revised their forecasts within 5 days of management guidance being provided.

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[15] Cotter, J., I. Tuna and P.D. Wysocki, 2005, Expectations Management and Beatable Targets: How Do Analysts React to Explicit Earnings Guidance?, Working Paper, SSRN.

These three findings all point in the same direction: management uses guidance as a way to manage short-term earnings (usually next quarter), with the intent of delivering positive earnings surprises, and not necessarily to improve long-term growth forecasts.

Proposition 6: While managers draw on better information than other investors, when forecasting earnings and cash flows, the legal and competitive constraints that they work under, and the bias endemic in these forecasts reduces their value and predictive power.

III. Market implied Growth

When investors attach a market price to a publicly traded company, they are incorporating their expectations of growth into that price. Consequently, we could back out the implied growth rate from the market price, if we are able to make reasonable assumptions about investors' required rates of return. As a very simple example, assume that you have a stock, trading at $ 40 a share, with dividends next year expected to be $4. If the required return on the stock is 8%, and the company is a stable growth company, the expected growth in dividends can be backed out of the price.

Price = 40 = Dividends next year/ (Required return – g) = 4/ (.08-g)

Expected growth rate = 4%

While the estimation becomes more complicated for high growth companies, the process of backing out the expected growth rate remains the same, with the focus being on growth in the high growth period.[16]

The process of backing out implied growth rates from a market price and a discounted cash flow model is time intensive, since it has to be repeated for each company. A simpler and less time intensive variation of the same theme is to use the market multiple that a firm trades at as a proxy for the market's expectation of growth. In effect, we are assuming that the market must be expecting higher growth from a company, if it attaches a higher PE ratio to its stock. The question of whether the market is, on average, right in coming up with these estimated values, has been examined with mixed conclusions. There are some studies that conclude that market PE ratios are

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[16] With a high growth company, there are two estimates of growth rates in the discounted cash flow model – one for high growth and one for stable growth. In general, the stable growth rate is assumed to be the same for all companies, allowing us to solve for the growth rate in the high growth period.

reasonable predictors of long-term earnings growth: higher PE companies, on average, deliver higher earnings growth in future periods. Ou and Penman (1989), Fuller, Huberts and Levinson (1992) and Penman (1996) all find support for the proposition that PE ratios are correlated with long term growth, albeit with significant error.[17] On the other hand, there are other studies that find that valuation ratios are not particularly good predictors of future growth. The earlier referenced paper by Chan, Karceski and Lakonishok (2003) concluded that valuation ratios were highly correlated with past growth but not with future growth.

Even if we buy into the proposition that the market is generally right in it's estimate of future growth, it is unclear how that growth rate can be used in valuation. After all, if the market is right in its estimate of growth, using that growth rate in a discounted cash flow valuation should lead to the conclusion that every stock is fairly priced (value = price). Notwithstanding this circularity, there may still be value in comparing the market implied growth rate in earnings to growth estimates used in a valuation.

Where does growth come from?

While we estimate growth for firms when valuing them, growth ultimately comes from the inner workings of the firm. In this section, we look at the underpinnings of growth first, by tracing it back to investment choices and operating efficiency, and decompose growth into its fundamental determinants. We then reexamine the past earnings growth numbers we looked at in an earlier section to see how much of it can be attributed to each determinant.

The determinants of growth

Growth is often considered a key input in valuation, but growth itself is an output of other decisions made by a firm. The best way to consider earnings growth is to break it down algebraically into its constituent parts. Define E_t to be the earnings in period t, I_t to

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[17] Ou, J. and S.H. Penman, 1989, Accounting Measurement, Price Earnings Ratios and the Informaion Content of Security Prices, Journal of Accounting Research, v27 , 111-144; Fuller, R.J., L.C. Huberts and M. Levinson, 1992, It's not higgledy piggledy growth, Journal of Portfolio Management, v18 , 38-45;

be the investment at the start of period t and ROI_t as the return on that investment. Thus, we can rewrite E_t as:

$E_t = ROI_t * I_t$

The change in earnings from period t-1 to t, , ΔE, can then be written as follows

$\Delta E = E_t - E_{t-1} = ROI_t * I_t - ROI_{t-1} * I_{t-1}$

The growth rate is written in terms of ΔE and E_{t-1}:

$g = \Delta E / E_{t-1} = (ROI_t * I_t - ROI_{t-1} * I_{t-1}) / E_{t-1}$

Consider the simplest scenario, where the ROI is stable and does not change from period to period ($ROI = ROI_t = ROI_{t-1}$). The expected growth rate in earnings for this firm is:

$g = \Delta E / E_{t-1} = ROI (I_t - I_{t-1}) / E_{t-1}$

$\qquad = ROI * (\Delta I / E_{\tau-1})$

In other words, the growth rate for this firm will be a function of only two variables – the return it makes on new investments (ROI) and the proportion of it's earnings that are put into new investments ($\Delta I / E_{\tau-1}$).

The more general scenario is one where the return on investment does change from period to period. In this case, the expected growth rate can be written as:

$g = \Delta E / E_{t-1} = ROI_t * (\Delta I / E_{\tau-1}) + (ROI_t - ROI_{t-1}) / ROI_{t-1}$

This equation is based on the assumption that the return on new investments in period t is identical to the return earned on existing investments in that period. In fact, this can be generalized even further, if we allow the return on new investments, $ROI_{New,t}$, to be different from the return on existing assets, $ROI_{Existing,t}$, the expected growth rate can be written as:

$g = \Delta E / E_{t-1} = ROI_{New,t} * (\Delta I / E_{\tau-1}) + (ROI_{Existing,t} - ROI_{Existing,t-1}) / ROI_{Existing,t-1}$

 The first term in this equation captures the growth from new investments, determined by the marginal return on those investments and the proportion invested in these investments. The second term captures the effect of changes in the return on investment on existing assets, a component that we will title "efficiency growth". Increasing the return on investment (improving efficiency) will create additional earnings growth,

Penman, S. H., 1996, The Articulation of Price Earnings Ratios and Market to Book Ratios and the

whereas declining efficiency (with drops in the return on investment) will reduce earnings growth.

Defining Investment and Return on Investment

While investment and return on investment are generic terms, the way in which we define them will depend upon whether we are looking at equity earnings or operating income. When looking at equity earnings, our focus is on the investment in equity and the return is the return on equity. When looking at operating earnings, the focus is on the investment in capital and the return is the return on capital. In the discounted cash flow models introduced at the start of this paper, the change in investment is computed as the reinvestment, with the measurement of the reinvestment again varying depending upon the cash flow being discounted. In dividend discount models, reinvestment is defined as retailed earnings (i.e.. any income not paid out as dividends). In free cash flow to equity (firm) models, reinvestment is defined in terms of the equity reinvestment rate (reinvestment rate). Table 7 summarizes the inputs for each measure depending on the measure of cash flow that we are focused on:

Table 7: Measuring Investment and Return on Investment

	Change in Investment	*Return on Investment*
Operating Income	Reinvestment Rate = $\dfrac{(Cap\ Ex\ -\ Deprec'n\ +\ \Delta WC)}{EBIT(1-t)}$	Return on Invested Capital
Net Income	Equity Reinvestment Rate = $\dfrac{(Cap\ Ex\ -\ Deprec'n\ +\ \Delta WC\ -\ \Delta Debt)}{Net\ Income}$	Non-cash Return on Equity
Earnings per share	Retention Ratio = $1-\dfrac{Dividends}{Net\ Income}$	Return on Equity

The second issue is how we estimate each of these numbers. It is conventional practice to use accounting measures of investment and return on investment. Thus, the book values of equity and invested capital and accounting earnings are used to compute returns on equity and capital. The problem with accounting measures on both dimensions

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Evaluation of Growth, Journal of Accounting Research, v34, 235-259.

is well documented, with accounting choices on restructuring charges, amortization and capitalization all making a difference in the final numbers. In a companion paper, we have examined how to correct the accounting numbers to arrive at better estimates of both investment and returns.[18]

The final issue that we have to consider is the difference between marginal and average returns. Note that the return on investment that we use to compute the growth from new investments should be the return earned on those investments alone, i.e, a marginal return. The return on existing assets is an average return on a portfolio of investments already made. While we often use the same value for both numbers in valuation, they can be different, in fact, very different in practice. This is also an issue that we examine in the companion paper mentioned in the prior paragraph.

New Investments

Using the formulation developed for expected earnings growth in this section, a key component of growth is the additional earnings generated by new investments made by a firm. In fact, for a firm with stable returns on existing assets, this is the only source of growth and for all firms, it the only source of long term sustainable growth.

If growth is a function of how much is reinvested and how well the investments pay off, it makes sense to look at what firms, on average, were doing on these dimensions. Table 8 summarizes the averages, by sector, for companies in the United States and the resulting sustainable growth rates in 2007.

Table 8: Growth Rate from New Investments in 2007 – US Companies

Primary Sector	# firms	ROIC	Reinvestment Rate	Fundamental Growth	ROE	Equity Reinvestment Rate	Fundamental Growth (Equity Earnings)
Consumer Discretionary	756	7.34%	45.54%	3.34%	6.17%	46.77%	2.88%
Consumer Staples	207	14.60%	26.85%	3.92%	23.43%	32.68%	7.66%
Energy	400	19.67%	56.36%	11.09%	26.21%	84.04%	22.03%
Financials	2039	NA	NA	NA	9.06%	47.84%	4.34%
Healthcare	761	13.46%	46.46%	6.25%	15.59%	55.30%	8.62%

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[18] Damodaran, A., 2007, Return on capital, Return on Invested Capital and Return on Equity: Measurement and Implications, Working Paper, SSRN.

Industrials	676	8.61%	54.00%	4.65%	18.74%	81.36%	15.25%
Information Technology	965	14.27%	39.41%	5.63%	14.19%	62.72%	8.90%
Materials	301	14.58%	82.63%	12.04%	23.40%	71.02%	16.62%
Telecommunication Services	122	9.49%	29.35%	2.78%	13.21%	74.83%	9.89%
Utilities	130	7.17%	55.23%	3.96%	15.17%	78.24%	11.87%
Grand Total	6502	11.80%	48.89%	5.77%	17.06%	69.04%	11.78%

As you browse this table, there are some caveats that have to be offered. First, these numbers represent unadjusted accounting numbers, with the flaws inherent in them. Second, these represent the values for one year. Given the volatility in these numbers from year to year, they will change over time. Table B provides a more detailed break down, by industry, of these statistics.

Reviewing the data on individual firms provides some interesting propositions. The first is that there are a significant number of firms (almost one in five) with negative reinvestment rates, where net cap ex and/or the change in working capital is negative. In effect, these firms are drawing down the capital that they have invested in the business. For some of these firms, this is a temporary phenomenon that will be reversed in future years. For some of these firms, however, this is part of a long term strategy to shrink operations and get more focused. Negative reinvestment rates, if maintained for long periods, will lead to negative growth rates. The other is that there are big differences in returns on capital across firms. As a result, the same reinvestment rate provides a much bigger bang for the buck in some companies (with high returns on capital) than it does in others.

Proposition 7: The long term (and sustainable growth rate) for a firm is a function of only two variables – the proportion of earnings that are invested back into the business (the reinvestment rate) and the returns earned on these investments.

Efficiency Growth

For many mature firms with limited investment opportunities, the potential for growth from new investments is limited. These firms cannot maintain a high reinvestment rate and deliver a high return on capital with that reinvestment. However, they can still grow at healthy rates if they can improve the returns that they earn on

existing assets. Conversely, declines in returns on existing assets can translate into drops in earnings growth rates.

When valuing companies, efficiency growth is pure gravy in terms of value created, since the growth comes with no concurrent cost. Unlike growth from new investments, where the positive effects of growth have to be offset against the negative effect of more investment, improving the return on capital on existing assets increases the growth rate without adversely affecting the cash flows. It should as come as no surprise, then, that analysts who want to increase the value of a company draw on the efficiency argument to justify much higher growth rates than those estimated using fundamentals.

While the potential for efficiency growth is always there, we should put some common sense constraints on how much we can draw on this growth.

1. There is more potential for efficiency growth at mature firms, with poor returns on capital (equity), than there is at firms that are performing well, for two reasons. First, improving the return on capital is a much more feasible option for a firm that generates a return on capital that is well below the sector average than at a firm that already outperforms the sector. Second, the effect of an improvement in returns on growth is much greater when the return on capital is low than when it is high. A firm that improves its return on capital from 5% to 6% will report a 20% growth rate from efficiency in that period, whereas a firm that improves its return on capital from 25% to 26% will generate a 4% growth rate from efficiency in that period.

2. You can draw on increased efficiency to justify growth only for finite periods. After all, a firm cannot be infinitely inefficient. Once the inefficiencies, no matter how significant, are fixed, the firm will have to revert back to its sustainable growth rate, based upon new investments. In discounted cash flow valuation, this has a practical consequence: you can draw on both efficiency and new investments to justify growth during the high growth period, but only on new investments to justify growth forever (in the terminal value computation).

In table 8, we estimated the sustainable growth rate in earnings that firms would post, based upon the quantity and quality of new investments. In table 9, we look at the actual growth rate in operating earnings in 2007 and break it down into new investment and efficiency growth, by sector.

Table 9: Break down of Operating Income Growth in 2007

Primary Sector	# firms	Growth in operating income	Growth rate from		Proportion of growth from	
			New investments	Efficiency	New investments	Efficiency
Consumer Discretionary	756	8.82%	3.34%	5.48%	37.90%	62.10%
Consumer Staples	207	11.60%	3.92%	7.68%	33.80%	66.20%
Energy	400	37.91%	11.09%	26.82%	29.25%	70.75%
Financials	2039	10.41%	NA	NA	NA	NA
Healthcare	761	16.58%	6.25%	10.33%	37.70%	62.30%
Industrials	676	20.72%	4.65%	16.08%	22.42%	77.58%
Information Technology	965	25.11%	5.63%	19.48%	22.41%	77.59%
Materials	301	24.71%	12.04%	12.67%	48.73%	51.27%
Telecommunication Services	122	15.91%	2.78%	13.12%	17.50%	82.50%
Utilities	130	9.62%	3.96%	5.66%	41.15%	58.85%
Grand Total	6502	16.94%	5.77%	11.17%	34.06%	65.94%

Note that almost two thirds of the growth in 2007 across all firms is explained by changes in returns on capital on existing assets. In fact, this has been the case for much of the last decade, with efficiency accounting for a significant portion of earnings growth in each year. It is also an explanation for how US firms collectively were able to return record amounts of cash to stockholders in the form of stock buybacks and dividends (reducing equity capital and reinvestment) and grow earnings at the same time. While that is good news for the period, it also offers a cautionary note for the future. As efficiency gains run their course, earnings growth rates will decline towards the sustainable growth rate. In other words, firms cannot continue to draw down capital and expect to keep growth at healthy levels.

Proposition 8: For mature firms that are under performing, relative to their sectors, the potential for efficiency growth, in the short term, is much greater than the potential for new investment growth.

How long does high growth last?

Consider a simple scenario. You have estimated a sustainable growth rate of 20% for your firm, based upon the reinvestment rate and the return on capital, and you feel reasonable secure about your numbers. You are now faced with a question of how long you can assume that your firm will grow at this rate – a key component in a valuation because it determines the length of the high growth period. Given both the empirical data that we have presented so far and the fundamental determinants of growth, what can we bring into answering this question?

Let us draw first on the historical data, where there are two findings that relate to this question.

a. Larger companies generally grow at lower rates than smaller firms, especially when it comes to revenues and operating income, though the potential for stock buybacks may keep earnings per share growth high.

b. Growth rates at companies bounce around, with little predictability. Firms that generate high growth in one period are just as likely to be low growth as high growth firms in the next period.

Both these findings suggest that we should be cautious about using high growth rates in earnings over long periods, partly because small firms will become big firms over time (and this will act as a drag on growth) and partly because competition will draw down growth.

Looking at the fundamentals – new investments and improved efficiency – that determine growth also provides us a prism for considering how long high growth can be sustained. For a firm to grow at a high rate, it has be able to reinvest a large proportion of its earnings, while maintaining a high return on capital. On both dimensions, size works against companies. As companies get larger, there will be downward pressure on both the reinvestment rate and the return on capital but there are two caveats to this general proposition. The first is that even large companies can keep reinvestment rates high by doing acquisitions, though it is questionable whether the return on capital can be sustained on these investments. The second is that even large companies can post extended periods of high growth, if they are major inefficiencies to begin with that get fixed over time.

The empirical evidence on how long growth lasts is surprisingly thin. In addition to the research on revenue growth at newly publicly companies by Metrick (2006) that we noted earlier in the paper, McKinsey has published some research on the speed at which growth fades at high growth companies. Across companies, growth rates fade towards that of the economy quickly. For instance, the real revenue growth rate of the companies that were in the S&P 500 in 1969 decreased from 7% in that year to the GDP growth rate of 4% in 1974 and down to 2% in 1979; the same phenomena is repeated for firms in the S&P 500 in 1975, 1985 and 1995.
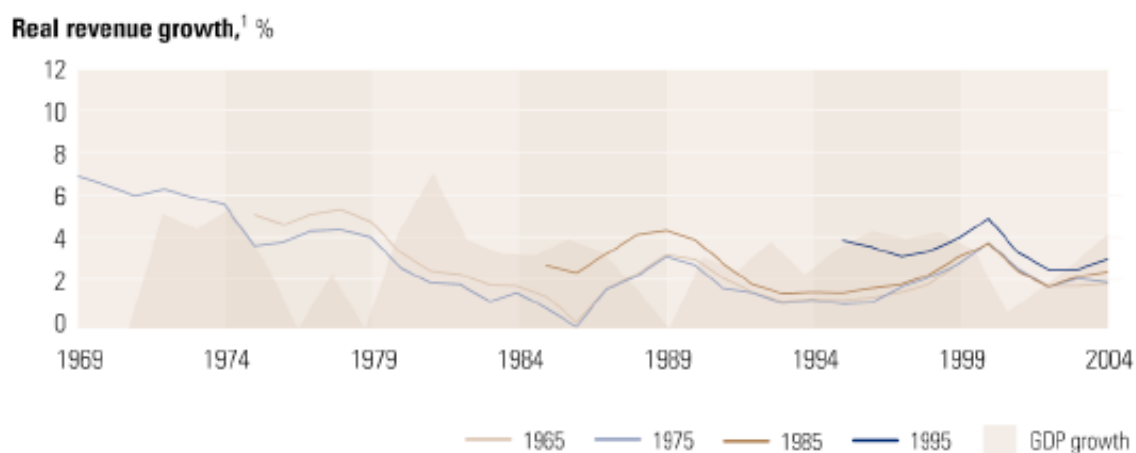
Earlier in this paper, we examined how to back out the implied growth rate from market prices, holding all else constant. In a variant of this approach, Rappaport (1986) and Mauboussin and Johnson (1997) take the high growth rate as a given and back out how long the market expect growth (and excess returns) to continue, based upon the market price and labeled the resulting number to be the competitive advantage period (CAP).[19]

Proposition 9: Firms that grow at rates higher than the economy for extended periods (10 years or more) are more the exception than the rule.

Growth and Value

In the first part of this paper, we noted the centrality of growth to value. Now that we have looked at the determinants of growth, we are in position to further elaborate on

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[19] Rappaport, A., 1986, Creating Shareholder Value, New York, NY, Free Press; Mauboussin, M. and P. Johnson, 1997, Competitive Advantage Period: The Neglected Value Driver, Financial Management, v26, 67-74.

the relationship between growth and value. To do this, we will begin by revisiting the discounted cash flow models that we introduced earlier and substituting the determinants of growth for the growth rate in the models. In the process, we will be able to see that growth does not always create value.

Revisiting DCF Models

We presented three versions of discounted cash flow models in the first section – a dividend discount model, a FCFE valuation model and a firm valuation model – and related value, in each model, to expected growth. Let us start with the dividend discount model:

$$\text{Value of Equity} = \sum_{t=1}^{t=\infty} \frac{\text{Net Income}_{\text{Current}}\,(1+g_{\text{Net Income}})^t (\text{Payout ratio})_t}{(1+k_e)^t}$$

In the stable growth version of the model, this can be written as:

$$\text{Value of Equity} = \frac{\text{Net Income}_{\text{Next year}}\,(\text{Payout ratio})}{k_e - g}$$

Note that the growth rate in the dividend discount model can be rewritten as a function of the payout ratio and the return on equity:

$$g_{\text{Net Income}} = (1 - \text{Payout ratio})\,\text{ROE}$$

Substituting back into the model:

$$\text{Value of Equity} = \frac{\text{Net Income}_{\text{Next year}}\,(1 - \frac{g}{\text{ROE}})}{k_e - g}$$

Using the same rationale, we can also develop a stable growth version of the firm valuation model, with the fundamentals incorporated into the model:

$$\text{Value of Firm} = \frac{EBIT(1-t)_{\text{Next year}}\,(1 - \frac{g}{\text{ROIC}})}{k_c - g}$$

In effect, we are replacing the reinvestment rates in these models with numbers that are consistent with our estimates of expected growth and return on investment.

Value Creating Growth versus Value Destroying Growth

Restating discounted cash flow models in terms of returns on equity (invested capital) yields an important benefit. Increasing growth is no longer an unalloyed plus, since the positive effect of higher growth have to be weighed against the negative effect of having to reinvest more (and thus delivering lower cash flows). Using the stable growth versions of the models developed in the last section, we can delineate the relationship between growth and value in both equity and firm valuation models.

In equity models, the key question is whether the return on equity on new investments is above, below or equal to the cost of equity. In the special case where the return on equity is equal to the cost of equity, growth has a neutral effect on value, with the positive effect of higher growth exactly offset by the negative effect of lower cash flows. Intuitively, this should not be surprising, since earning your cost of equity on new investments is the equivalent of taking zero net present value investments. If the return on equity is higher than the cost of equity, increasing growth will increase value, whereas when investing more when the return on equity is less than the cost of equity is s recipe for value destruction.

In firm valuation models, the results are analogous, using return on invested capita and cost of capital as the comparison metrics. A firm that generates a return on capital equal to its cost of capital will create no value as it increases growth, whereas a firm that is able to earn more (less) than its cost of capital will increase (decrease) value as it increases growth.

This insight is neither innovative nor particularly original, but it is worth keeping in mind in a world where growth is often valued for its own sake. As we observe analysts and investors push up stock prices for companies with high growth, using the growth rate as a justification, it is worth stopping and asking whether higher growth will translate into higher value.

Proposition 10: It is not growth, per se, that creates value but growth with positive excess returns. Higher growth can add value, destroy value or leave value unchanged.

Empirical Evidence

In the last few sections, we have provided data on earnings growth rates across time, across companies and across measures. Now that we have a way of differentiating between value creating and value destroying growth, it is worth reviewing that data with two questions: Is the growth at companies value creating or value destroying growth? Does the market (as opposed to investors and analysts) differentiate between good and bad growth when it comes to pricing stocks?

To answer the first question, we looked at the excess returns generated by firms on two different dimensions – to equity investors, as the difference between the return on equity and the cost of equity and to the entire firm, as the difference between the return on capital and the cost of capital. In figure 2, we summarize our findings across companies (Table C at the end of the paper lists out excess returns by industry, in the United States).

Figure 2: Excess Returns at US firms: 2007
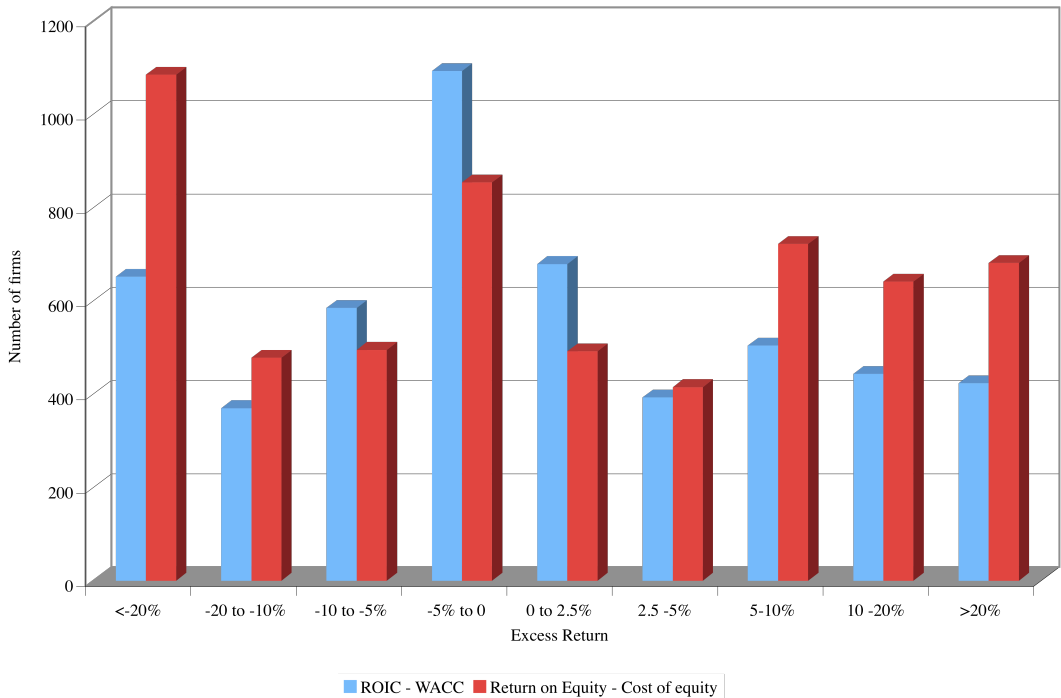
With the caveat that these represent values for one year, there are some cautionary notes for analysts who value growth for its own sake. Almost half of all firms generated returns on capital (equity) that were lower than the cost of capital (equity), suggesting that there is substantial value destruction at firms.

The second question can be answered by looking at the market prices at which firms trade at in the market. If the hypothesis about value creating and value destroying growth holds, you should expect to see growth valued more highly at firms that generate large positive excess returns than at firms with smaller positive excess returns. To test this hypothesis, we categorized firms at the start of 2008 into four groups, based upon the excess equity returns (i.e., the difference between the return on equity and the cost of equity). We then regressed the price earnings ratio at the start of 2008 against the analyst estimates of expected earnings per share growth over the next 5 years:[20]

PE = a + b (Expected growth rate in earnings per share)

The coefficient on the earnings growth variable becomes a measure of the price the market is willing to pay for growth.[21] Table 10 summarizes our findings:

Table 10: The Value of Growth – Excess Return Classes: US companies in January 2008

Return on equity minus Cost of Equity	Regression output	R^2
>10%	PE = 9.05 + 1.31 Expected EPS growth (9.44) (13.86)	29.0%
5 – 10%	PE = 4.59 + 1.19 Expected EPS growth (4.36) (15.93)	39.3%
0 – 5%	PE = 12.54 + 0.63 Expected EPS growth (14.51) (10.48)	15.4%
Negative	PE = 21.16 + 0.35 Expected EPS growth (11.01) (3.34)	7.5%

While this is one year's data, there are clear patterns that emerge that support the hypothesis that the value of growth depends upon the excess returns that accompany that growth. For firms that have excess returns greater than 10%, every 1% increase in growth rate translates into an increase of 1.31 in the price earnings ratio. As excess returns decrease, the value attached to growth also decreases. For firms that have negative excess returns, a 1% increase in the expected growth results in an increase of only 0.35 in the

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[20] The sample includes all publicly traded US firms. We used the trailing PE ratio for each firm and the consensus growth rate in earnings per share (from analyst estimates). The data was obtained from Value Line.

[21] There are potential non-linearity in the relationship. However, we chose to run a linear regression to preserve the intuitive value of the growth coefficient.

price earnings ratio. It is also noteworthy that the portion of the PE explained by expected growth also drops off as the excess returns fade, with the R^2 only 7.5% for firms with negative excess returns.

Finally, there are numerous growth strategies available to firms. They can expand into new markets, compete for higher market share in an existing market, introduce innovative products or acquire other companies. While each strategy has its proponents and all of them can be used to increase the growth rate, it is worth probing which ones provide the best potential for value creation. To answer this question, McKinsey categorized growth strategies used by publicly traded consumer goods companies over the last few decades and chronicled the value added or destroyed by each strategy. Figure 3 summarizes their findings:

Figure 3: Value Created by Growth Category – Consumer Goods

Modes of organic growth vary in value creation intensity— consumer goods industry

Category of growth	Shareholder value created for incremental $1 million of growth/ target acquisition size[1]	Revenue growth/ acquisition size necessary to double typical company's share price,[2] $ billions
New-product market development	1.75–2.00	5–6
Expanding an existing market	0.30–0.75	13–33
Maintaining/growing share in a growing market	0.10–0.50	20–100
Competing for share in a stable market	−0.25–0.40	n/m–25
Acquisition (25th to 75th percentile result)[3]	−0.5–0.20	n/m–50

While it is dangerous to generalize from a small sample, there are interesting differences across the different growth strategies. For instance, investments in new products clearly provide a much bigger bang for the buck than acquisitions: a dollar invested in new product development creates $1.75 to $ 2 in additional value for the firm. Competing for share in a stable market and acquisitions are the only strategies where there is a significant chance of value destruction.

Conclusion

Growth is a central input to both discounted cash flow and relative valuation models. In this paper, we begin with a look at past earnings growth, with the intent of detecting patterns and broad lessons for future growth predictions. In particular, we find that growth rates tend to vary widely across sectors and across different measures of earnings, are lower for larger firms and reveal little persistence. Firms that have grown at high rates in the past are just as likely to be low growth firms in the future as high growth firms. Next we look at forecasts of growth made by analysts and managers, as well as backing out the implied growth rate in market prices. While there is information in these forecasts, there is also substantial error and they all have low predictive power. Finally, we turn to the determinants of growth and argue that growth ultimately can be traced back to either new investments (and the marginal returns on those new investments) or to improved efficiency. We use that insight to develop the relationship between growth and value, and argue that growth can be value destructive in some cases.

Table A: Historical Growth Rates – By Industry in the US

Primary Industry	Number of firms	Annual Growth Rate -1997 to 2002				Annual Growth Rate – 2002 to 2007			
		Revenues	EBITDA	EBIT	Net Income	Revenues	EBITDA	EBIT	Net Income
Advertising	21	31.47%	10.12%	2.10%	-73.76%	43.18%	28.35%	-28.95%	-38.43%
Aerospace and Defense	74	7.53%	-0.80%	-8.99%	-43.59%	16.58%	-20.12%	-31.02%	-23.34%
Agricultural Products	12	1.52%	-3.10%	-50.00%	-25.05%	12.96%	-51.41%	-26.89%	-35.08%
Air Freight and Logistics	16	28.86%	5.40%	-8.72%	-49.41%	13.17%	8.86%	5.80%	-11.08%
Airlines	26	8.93%	-49.17%	-115.94%	-119.66%	20.26%	7.92%	-27.31%	3.71%
Airport Services	4	NA	NA	NA	NA	-42.80%	-35.67%	-37.38%	-42.15%
Alternative Carriers	18	30.99%	-129.68%	-141.57%	-201.93%	40.75%	-5.69%	-21.57%	-105.20%
Aluminum	5	-28.33%	-39.38%	-97.14%	-138.06%	21.11%	-13.70%	67.85%	42.50%
Apparel Retail	52	9.60%	13.78%	1.56%	-0.16%	11.72%	1.03%	-19.86%	-38.83%
Apparel, Accessories and Luxury Goods	49	7.96%	2.83%	0.60%	-22.95%	24.46%	-18.28%	-26.26%	-59.99%
Application Software	127	17.72%	-47.14%	-88.94%	-102.76%	13.75%	1.60%	-6.67%	-13.54%
Asset Management and Custody Banks	949	-2.78%	-6.19%	-10.95%	-50.33%	-22.19%	4.30%	-29.54%	-66.30%
Auto Parts and Equipment	41	11.03%	3.30%	-8.24%	-118.22%	9.89%	7.63%	1.90%	-35.67%
Automobile Manufacturers	11	7.09%	-8.10%	-8.33%	-37.47%	3.61%	-19.83%	-42.78%	-55.56%
Automotive Retail	18	32.27%	31.47%	26.14%	31.69%	11.55%	-3.36%	-6.86%	-42.71%
Biotechnology	236	12.81%	-135.62%	-139.87%	-216.22%	19.63%	-94.31%	-76.05%	-109.47%
Brewers	7	4.14%	5.13%	4.60%	2.27%	13.28%	-16.12%	23.59%	-16.44%
Broadcasting and Cable TV	55	34.05%	26.00%	5.96%	-128.11%	18.81%	5.83%	7.40%	-59.09%
Building Products	26	5.99%	3.67%	2.69%	-44.16%	8.07%	-21.30%	-26.85%	-60.78%
Casinos and Gaming	32	28.71%	29.12%	24.59%	-36.77%	28.08%	-20.51%	-31.04%	-13.05%
Catalog Retail	5	19.09%	-12.93%	-27.24%	-93.92%	11.63%	14.49%	-68.46%	75.90%
Coal and Consumable Fuels	25	-10.48%	-34.95%	-46.61%	-64.75%	22.60%	21.87%	-5.98%	12.95%
Commercial Printing	14	11.28%	4.46%	2.46%	-47.88%	18.41%	-12.76%	-20.13%	-41.14%
Commodity Chemicals	20	0.20%	-13.84%	-32.55%	-54.52%	12.23%	3.99%	2.91%	-31.96%
Communications Equipment	136	10.97%	-61.58%	-105.35%	-111.99%	17.10%	-23.30%	-32.90%	-63.44%
Computer and Electronics Retail	9	5.99%	5.64%	4.55%	-23.32%	8.40%	-17.70%	-35.44%	-48.68%
Computer Hardware	19	26.64%	-26.52%	-59.79%	-109.83%	18.67%	-18.29%	-21.02%	-57.60%

Computer Storage and Peripherals	47	7.85%	-45.41%	-68.54%	-84.08%	12.17%	-28.68%	-43.34%	-23.24%
Construction and Engineering	32	11.41%	-13.33%	-8.72%	-66.57%	7.26%	-8.13%	-1.56%	-39.00%
Construction and Farm Machinery and Heavy Trucks	37	3.47%	-10.67%	-26.64%	-98.66%	11.34%	24.74%	37.73%	33.35%
Construction Materials	12	40.26%	13.76%	12.87%	-31.49%	15.60%	8.98%	-15.80%	4.04%
Consumer Electronics	17	13.88%	-12.17%	-21.28%	-23.11%	5.51%	-33.55%	-45.24%	-88.79%
Consumer Finance	29	22.47%	23.71%	4.99%	-4.97%	18.74%	-27.33%	-30.70%	-65.24%
Data Processing and Outsourced Services	42	24.81%	18.34%	19.49%	3.82%	16.04%	10.27%	-0.89%	-17.13%
Department Stores	11	5.11%	-12.89%	-16.17%	-96.22%	6.35%	5.94%	-12.00%	20.33%
Distillers and Vintners	7	4.34%	6.89%	9.94%	13.24%	14.70%	14.14%	18.22%	26.24%
Distributors	19	15.49%	20.32%	18.41%	-75.89%	3.60%	-9.76%	-22.02%	-85.89%
Diversified Banks	40	0.54%	NA	NA	-19.63%	22.01%	NA	NA	28.93%
Diversified Capital Markets	4	8.86%	NA	NA	-140.41%	5.17%	NA	NA	-62.97%
Diversified Chemicals	14	-0.91%	-7.01%	-14.25%	-116.41%	9.08%	11.59%	21.75%	60.44%
Diversified Commercial and Professional Services	65	11.30%	-10.13%	-8.70%	-45.82%	14.04%	7.43%	17.95%	22.85%
Diversified Metals and Mining	45	-30.77%	-24.13%	-43.19%	-82.82%	1.19%	41.41%	47.95%	70.74%
Diversified REITs	14	11.53%	-12.18%	-20.81%	-0.33%	3.59%	-20.09%	-26.31%	-31.37%
Drug Retail	6	11.09%	6.53%	7.30%	-43.89%	10.93%	9.64%	-21.78%	-21.70%
Education Services	19	24.65%	25.18%	-0.91%	18.19%	17.71%	-5.86%	19.21%	9.64%
Electric Utilities	39	5.56%	-2.54%	-9.13%	-42.70%	9.06%	7.00%	6.00%	6.44%
Electrical Components and Equipment	89	1.63%	-46.89%	-60.72%	-92.87%	18.94%	22.01%	25.14%	10.54%
Electronic Equipment Manufacturers	103	10.81%	-55.61%	-78.89%	-124.30%	13.40%	-6.81%	-14.84%	-40.68%
Electronic Manufacturing Services	38	9.18%	-30.28%	-62.10%	-115.82%	13.02%	-18.23%	-26.89%	-37.04%
Environmental and Facilities Services	30	27.25%	23.84%	28.71%	-74.57%	16.38%	17.66%	10.59%	-46.52%
Fertilizers and Agricultural Chemicals	16	11.89%	-5.32%	-29.67%	-92.96%	16.16%	29.46%	39.47%	48.80%
Food Distributors	8	5.69%	4.67%	5.51%	8.37%	9.15%	-13.94%	-15.39%	6.47%
Food Retail	16	7.50%	9.17%	-1.19%	-27.04%	7.80%	5.09%	6.45%	21.22%
Footwear	15	10.05%	-2.55%	-13.65%	-47.27%	60.04%	2.21%	2.16%	-41.91%
Forest Products	5	-5.83%	-3.84%	-40.55%	-102.38%	-2.05%	-72.15%	-64.73%	31.41%
Gas Utilities	29	7.12%	6.61%	2.85%	-5.69%	12.87%	9.56%	11.10%	18.58%
General Merchandise Stores	8	13.85%	13.92%	12.45%	14.84%	8.17%	-2.40%	-11.11%	-28.31%

Gold	41	5.95%	4.15%	-22.10%	9.10%	28.98%	18.02%	-34.69%	-70.42%
Health Care Technology	30	28.96%	-35.76%	-29.13%	-62.58%	15.98%	-49.52%	-65.68%	-82.67%
Healthcare Distributors	14	15.64%	16.30%	11.73%	-9.54%	9.91%	5.60%	18.46%	12.10%
Healthcare Equipment	146	21.92%	-28.23%	-41.58%	-40.55%	24.32%	-24.00%	-42.35%	-60.39%
Healthcare Facilities	35	14.83%	13.85%	3.72%	-17.91%	11.96%	12.10%	-2.88%	-50.49%
Healthcare Services	57	25.16%	4.76%	1.84%	-8.25%	17.65%	16.05%	7.51%	-7.17%
Healthcare Supplies	37	16.12%	-16.89%	-15.13%	-6.79%	24.55%	20.08%	12.18%	-15.50%
Heavy Electrical Equipment	9	27.65%	0.99%	-4.11%	8.65%	14.47%	39.24%	70.40%	24.99%
Highways and Railtracks	1	15.06%	35.96%	10.46%	NA	6.95%	-1.38%	-3.46%	-13.28%
Home Entertainment Software	17	14.68%	19.09%	-10.89%	-40.95%	24.50%	-60.59%	-92.25%	-69.02%
Home Furnishing Retail	10	18.79%	23.43%	25.77%	22.88%	8.02%	-45.82%	-68.08%	-66.23%
Home Furnishings	15	3.67%	4.02%	4.21%	-28.78%	3.24%	-39.40%	-63.53%	-78.10%
Home Improvement Retail	4	13.03%	17.70%	18.76%	14.60%	9.33%	10.44%	9.74%	18.07%
Homebuilding	30	16.43%	12.54%	9.54%	14.17%	10.43%	-68.56%	-89.84%	-178.34%
Hotels, Resorts and Cruise Lines	26	7.81%	2.22%	-12.01%	-2.19%	17.99%	-3.39%	-10.34%	-18.40%
Household Appliances	11	5.80%	5.29%	5.90%	-28.09%	14.26%	-8.62%	-9.66%	19.41%
Household Products	15	2.15%	10.79%	5.84%	4.23%	16.05%	9.07%	8.12%	-47.43%
Housewares and Specialties	17	6.08%	4.20%	3.58%	-25.22%	12.03%	9.84%	9.68%	-6.24%
Human Resource and Employment Services	28	4.71%	-31.97%	-65.18%	-149.62%	15.68%	27.61%	57.21%	0.00%
Hypermarkets and Super Centers	6	19.77%	10.48%	9.38%	8.95%	13.87%	12.47%	13.84%	9.87%
Independent Power Producers and Energy Traders	15	25.12%	25.84%	0.74%	-97.00%	12.10%	13.78%	17.21%	-29.10%
Industrial Conglomerates	19	8.39%	-8.18%	-13.63%	-70.65%	9.06%	-1.92%	1.76%	3.68%
Industrial Gases	3	3.23%	2.44%	2.13%	4.20%	14.18%	14.87%	16.57%	22.15%
Industrial Machinery	86	0.12%	-18.09%	-23.98%	-57.21%	15.11%	10.46%	10.93%	15.02%
Industrial REITs	8	23.54%	25.30%	21.96%	25.40%	25.52%	15.69%	13.68%	15.79%
Insurance Brokers	15	17.28%	15.81%	17.29%	18.88%	18.33%	2.65%	1.46%	4.95%
Integrated Oil and Gas	29	11.21%	10.60%	8.40%	-29.10%	57.80%	28.73%	42.72%	36.40%
Integrated Telecommunication Services	62	12.14%	1.76%	-25.21%	-93.19%	13.10%	9.01%	8.59%	-14.46%
Internet Retail	20	35.87%	15.45%	-13.60%	172.08%	29.26%	15.14%	27.29%	-19.00%
Internet Software and Services	127	98.19%	-70.95%	-62.83%	-132.10%	25.73%	-4.70%	-11.80%	-34.20%
Investment Banking and Brokerage	44	7.91%	NA	2.88%	-77.60%	16.94%	-150.19%	-75.28%	-12.62%

IT Consulting and Other Services	59	12.25%	-40.56%	-64.45%	-107.20%	17.71%	-18.50%	-16.33%	-21.99%
Leisure Facilities	13	14.17%	-16.29%	-7.86%	-143.32%	14.64%	16.17%	1.53%	-2.40%
Leisure Products	29	4.77%	-25.35%	-26.05%	-38.06%	11.00%	-18.51%	-28.00%	-35.33%
Life and Health Insurance	28	11.82%	-48.90%	-45.90%	-48.54%	12.88%	25.98%	40.26%	17.35%
Life Sciences Tools and Services	57	30.57%	5.75%	2.19%	-17.32%	14.52%	-6.87%	-4.24%	-9.06%
Managed Healthcare	19	25.34%	-4.18%	-4.13%	-16.20%	9.94%	8.89%	-1.35%	9.13%
Marine	27	0.80%	17.25%	-7.38%	-57.84%	28.19%	43.37%	58.68%	92.44%
Marine Ports and Services	3	NA	NA	NA	NA	55.42%	98.13%	102.56%	111.02%
Metal and Glass Containers	13	5.57%	-13.30%	-15.63%	-92.10%	8.60%	5.46%	9.09%	21.69%
Mortgage REITs	37	30.02%	NA	NA	52.36%	-7.72%	NA	NA	-126.55%
Motorcycle Manufacturers	2	19.37%	25.48%	26.73%	27.22%	7.38%	9.01%	10.06%	9.99%
Movies and Entertainment	32	13.88%	-21.73%	-19.59%	-160.71%	13.99%	-16.87%	-31.37%	-33.55%
Multi-line Insurance	19	7.24%	-14.41%	-19.41%	-61.02%	9.85%	25.17%	37.64%	34.52%
Multi-Sector Holdings	8	1.39%	-13.27%	-70.11%	-105.89%	8.07%	2.18%	-49.03%	-45.98%
Multi-Utilities	31	6.15%	3.62%	-1.26%	-58.24%	8.38%	5.97%	3.68%	12.31%
Office Electronics	3	3.46%	3.51%	1.83%	-7.94%	8.19%	8.55%	9.91%	32.25%
Office REITs	18	31.63%	30.36%	34.72%	36.38%	24.21%	21.16%	14.57%	18.68%
Office Services and Supplies	23	3.37%	5.14%	-7.63%	-43.26%	6.80%	5.36%	-7.69%	-8.21%
Oil and Gas Drilling	19	8.25%	2.70%	-49.48%	-94.35%	32.17%	41.45%	58.86%	55.45%
Oil and Gas Equipment and Services	66	8.46%	-9.45%	-41.92%	-69.62%	28.07%	43.88%	49.24%	40.06%
Oil and Gas Exploration and Production	163	18.63%	6.38%	-15.22%	-14.04%	40.75%	30.30%	24.71%	10.17%
Oil and Gas Refining and Marketing	27	32.88%	10.98%	-23.60%	-55.96%	34.59%	50.63%	64.30%	92.12%
Oil and Gas Storage and Transportation	72	25.37%	15.79%	11.59%	-25.22%	29.97%	6.44%	-4.69%	-5.28%
Other Diversified Financial Services	7	12.85%	17.33%	15.62%	-0.73%	12.49%	21.89%	14.96%	-13.66%
Packaged Foods and Meats	66	8.03%	3.85%	-6.13%	-22.05%	6.05%	3.49%	2.96%	1.90%
Paper Packaging	13	5.35%	5.60%	14.92%	-29.75%	6.34%	-0.93%	-9.90%	-57.72%
Paper Products	16	3.58%	1.88%	-0.31%	-58.88%	11.89%	8.89%	16.84%	0.48%
Personal Products	34	8.00%	0.44%	-8.15%	-30.17%	22.08%	-27.65%	-35.73%	-35.24%
Pharmaceuticals	128	22.58%	-2.37%	-11.25%	-44.50%	19.90%	-32.15%	-17.51%	-32.61%
Photographic Products	3	4.90%	-3.12%	-94.31%	86.02%	-7.95%	-112.31%	-24.05%	-130.53%
Precious Metals and Minerals	21	-11.74%	-37.16%	NA	22.67%	60.44%	18.49%	-59.55%	-87.02%

Property and Casualty Insurance	78	19.10%	-23.59%	-26.35%	-31.24%	7.87%	13.02%	20.44%	3.27%
Publishing	36	7.46%	-0.83%	-1.13%	-34.74%	4.41%	8.59%	7.76%	-15.61%
Railroads	10	1.24%	-1.52%	-19.31%	-4.91%	14.76%	17.10%	23.53%	-9.75%
Real Estate Management and Development	38	4.90%	-19.84%	-62.52%	-72.60%	15.69%	9.65%	-24.63%	-25.07%
Regional Banks	390	14.52%	NA	NA	8.74%	12.17%	NA	NA	-1.84%
Reinsurance	18	23.27%	-26.10%	18.67%	20.48%	3.33%	-13.66%	16.65%	10.76%
Residential REITs	20	14.98%	13.48%	6.08%	8.11%	8.67%	10.25%	3.19%	-26.34%
Restaurants	62	12.50%	16.33%	9.00%	-26.95%	12.01%	3.43%	-13.38%	-17.57%
Retail REITs	29	13.69%	7.41%	17.08%	-7.31%	18.48%	18.46%	9.02%	15.04%
Semiconductor Equipment	61	3.97%	-119.14%	-167.21%	-199.20%	14.22%	26.85%	33.47%	21.01%
Semiconductors	119	18.47%	-56.73%	-96.04%	-112.72%	24.34%	-11.94%	-17.12%	-8.91%
Soft Drinks	19	13.63%	15.91%	13.66%	20.06%	12.44%	-17.61%	-18.25%	-13.90%
Specialized Consumer Services	19	15.77%	-4.81%	-24.11%	-81.13%	7.31%	-15.05%	-10.91%	-43.60%
Specialized Finance	25	16.70%	-34.25%	-61.98%	-58.87%	1.83%	37.17%	51.00%	-3.06%
Specialized REITs	33	14.13%	8.19%	4.60%	-44.71%	19.13%	19.14%	20.86%	-3.25%
Specialty Chemicals	43	6.36%	-5.65%	-17.25%	-60.65%	16.35%	5.86%	-0.55%	-8.50%
Specialty Stores	38	9.47%	12.87%	-6.86%	-48.13%	8.71%	-0.93%	-9.14%	-12.74%
Steel	33	1.17%	-6.80%	-36.58%	-75.39%	29.11%	43.24%	57.16%	54.39%
Systems Software	49	7.18%	-39.53%	-62.27%	-104.03%	14.49%	6.48%	-13.39%	-7.70%
Technology Distributors	20	7.95%	-24.91%	-49.25%	-137.04%	10.36%	-0.54%	-2.37%	-0.72%
Textiles	6	-5.28%	-19.28%	-31.57%	-98.83%	4.63%	6.09%	-1.21%	-65.22%
Thrifts and Mortgage Finance	187	11.77%	17.48%	20.03%	4.28%	-1.68%	-136.45%	-148.09%	-41.62%
Tires and Rubber	3	8.16%	-8.00%	-16.45%	-109.61%	16.63%	7.76%	14.11%	1.36%
Tobacco	11	2.68%	-7.94%	-26.08%	-56.73%	-3.60%	19.28%	7.80%	9.67%
Trading Companies and Distributors	28	9.04%	-6.18%	-9.42%	-82.90%	8.74%	15.17%	11.46%	29.83%
Trucking	26	8.35%	-4.70%	-4.01%	-17.33%	9.73%	8.06%	2.17%	-24.62%
Water Utilities	16	8.31%	6.97%	6.81%	8.08%	5.28%	-4.61%	-6.99%	-26.86%
Wireless Telecommunication Services	42	41.34%	13.78%	-26.45%	-99.48%	17.82%	15.49%	15.91%	-25.05%
Grand Total	**6500**	**12.67%**	**-11.65%**	**-23.74%**	**-48.09%**	**13.00%**	**1.58%**	**-5.76%**	**-20.68%**

Table B: Fundamental Growth Rates by Industry for 2007 – United States

Primary Industry	# firms	ROC	Reinvestment Rate	Fundamental Growth	ROE	Equity Reinvestment Rate	Equity fundamental growth
Advertising	21	10.90%	65.87%	7.18%	15.26%	-19.52%	-2.98%
Aerospace and Defense	74	16.98%	32.76%	5.56%	25.00%	25.71%	6.43%
Agricultural Products	12	10.22%	-164.98%	-16.87%	20.71%	-244.01%	-50.53%
Air Freight and Logistics	16	19.35%	26.30%	5.09%	8.01%	-148.75%	-11.92%
Airlines	26	7.43%	201.31%	14.95%	NA	NA	NA
Airport Services	4	3.97%	372.81%	14.79%	2.31%	338.40%	7.83%
Alternative Carriers	18	-1.08%	-579.04%	6.27%	-34.70%	NA	NA
Aluminum	5	9.91%	77.54%	7.68%	14.14%	58.94%	8.33%
Apparel Retail	51	15.90%	69.04%	10.98%	14.64%	26.90%	3.94%
Apparel, Accessories and Luxury Goods	50	12.75%	94.76%	12.09%	12.06%	54.25%	6.54%
Application Software	127	17.98%	76.65%	13.78%	17.23%	32.00%	5.51%
Asset Management and Custody Banks	949	4.02%	43.06%	1.73%	10.96%	14.50%	1.59%
Auto Parts and Equipment	41	9.55%	-7.70%	-0.74%	16.83%	-78.39%	-13.19%
Automobile Manufacturers	11	4.82%	-13.17%	-0.64%	-5.12%	NA	NA
Automotive Retail	18	7.94%	353.37%	28.07%	12.30%	517.60%	63.65%
Biotechnology	236	5.32%	59.52%	3.17%	-1.48%	353.21%	-5.22%
Brewers	7	13.11%	21.45%	2.81%	22.83%	-10.57%	-2.41%
Broadcasting and Cable TV	55	6.07%	42.47%	2.58%	2.89%	126.71%	3.66%
Building Products	26	6.20%	185.02%	11.47%	4.59%	756.56%	34.72%
Casinos and Gaming	32	5.44%	432.03%	23.51%	10.69%	304.43%	32.54%
Catalog Retail	6	4.82%	-31.21%	-1.50%	5.11%	-212.42%	-10.84%
Coal and Consumable Fuels	24	9.21%	145.40%	13.38%	14.81%	71.92%	10.65%
Commercial Printing	14	10.40%	282.36%	29.35%	5.33%	-55.13%	-2.94%
Commodity Chemicals	20	8.80%	30.12%	2.65%	10.02%	98.86%	9.91%
Communications Equipment	136	13.33%	85.02%	11.34%	14.86%	52.74%	7.84%
Computer and Electronics Retail	9	16.88%	39.21%	6.62%	14.11%	56.50%	7.97%
Computer Hardware	19	25.10%	23.10%	5.80%	28.75%	-33.19%	-9.54%
Computer Storage and Peripherals	47	11.01%	64.90%	7.14%	16.32%	35.47%	5.79%

Construction and Engineering	32	20.56%	200.85%	41.29%	19.67%	173.77%	34.18%
Construction and Farm Machinery and Heavy Trucks	37	10.44%	64.92%	6.78%	25.20%	30.93%	7.79%
Construction Materials	12	10.82%	636.25%	68.84%	18.53%	244.30%	45.28%
Consumer Electronics	17	10.00%	64.16%	6.41%	10.83%	102.87%	11.14%
Consumer Finance	29	NA	NA	NA	9.93%	-1207.76%	-119.90%
Data Processing and Outsourced Services	42	12.39%	98.61%	12.21%	11.23%	-29.98%	-3.37%
Department Stores	11	7.34%	-15.06%	-1.11%	11.04%	-97.21%	-10.73%
Distillers and Vintners	7	12.79%	5.80%	0.74%	22.15%	-55.44%	-12.28%
Distributors	19	12.06%	266.79%	32.16%	1.96%	396.81%	7.78%
Diversified Banks	40	NA	NA	NA	18.54%	-80.89%	-14.99%
Diversified Capital Markets	4	NA	NA	NA	-8.25%	NA	NA
Diversified Chemicals	14	12.24%	-6.46%	-0.79%	22.74%	-16.37%	-3.72%
Diversified Commercial and Professional Services	67	14.19%	102.12%	14.49%	18.97%	70.46%	13.36%
Diversified Metals and Mining	46	24.29%	155.39%	37.74%	39.37%	41.97%	16.52%
Diversified REITs	14	2.95%	-31.05%	-0.91%	14.21%	-297.86%	-42.32%
Drug Retail	6	10.24%	120.41%	12.33%	8.90%	-65.11%	-5.79%
Education Services	19	33.60%	47.28%	15.88%	22.84%	47.04%	10.75%
Electric Utilities	39	7.14%	84.31%	6.02%	11.51%	45.48%	5.24%
Electrical Components and Equipment	90	15.20%	88.47%	13.45%	20.45%	18.14%	3.71%
Electronic Equipment Manufacturers	103	9.19%	48.70%	4.48%	10.01%	72.82%	7.29%
Electronic Manufacturing Services	38	6.82%	91.96%	6.27%	-3.01%	NA	NA
Environmental and Facilities Services	30	9.22%	57.97%	5.34%	15.47%	106.09%	16.41%
Fertilizers and Agricultural Chemicals	16	20.95%	50.19%	10.52%	31.15%	51.74%	16.12%
Food Distributors	8	18.97%	1.39%	0.26%	27.77%	-49.28%	-13.69%
Food Retail	16	9.59%	76.58%	7.34%	13.97%	83.02%	11.60%
Footwear	15	23.41%	32.56%	7.62%	23.05%	5.96%	1.37%
Forest Products	5	1.11%	307.02%	3.41%	-2.98%	NA	NA
Gas Utilities	29	8.94%	107.79%	9.63%	16.51%	62.47%	10.32%
General Merchandise Stores	8	12.33%	7.02%	0.87%	16.57%	-203.01%	-33.65%
Gold	40	5.15%	218.66%	11.26%	1.62%	665.95%	10.79%

Health Care Technology	30	13.35%	106.65%	14.23%	28.33%	4.02%	1.14%
Healthcare Distributors	14	13.10%	172.23%	22.56%	17.40%	101.98%	17.74%
Healthcare Equipment	147	11.51%	79.61%	9.16%	9.97%	21.61%	2.16%
Healthcare Facilities	35	7.40%	468.47%	34.67%	13.06%	41.79%	5.46%
Healthcare Services	57	12.09%	96.65%	11.68%	15.71%	13.30%	2.09%
Healthcare Supplies	37	17.92%	113.44%	20.33%	18.54%	-1.60%	-0.30%
Heavy Electrical Equipment	9	48.01%	-11.74%	-5.64%	54.54%	-6.15%	-3.35%
Highways and Railtracks	1	5.30%	-176.81%	-9.38%	5.97%	-557.14%	-33.25%
Home Entertainment Software	17	7.41%	63.95%	4.74%	3.47%	117.16%	4.06%
Home Furnishing Retail	10	11.83%	2.26%	0.27%	11.92%	-4.29%	-0.51%
Home Furnishings	15	5.73%	66.61%	3.82%	7.11%	132.81%	9.44%
Home Improvement Retail	4	12.51%	68.15%	8.52%	16.11%	13.92%	2.24%
Homebuilding	30	-0.86%	-3054.14%	26.35%	-34.97%	-174.19%	60.92%
Hotels, Resorts and Cruise Lines	26	7.12%	144.40%	10.29%	12.70%	36.03%	4.58%
Household Appliances	11	12.67%	12.33%	1.56%	20.19%	7.69%	1.55%
Household Products	15	12.80%	5.82%	0.74%	20.05%	-14.43%	-2.89%
Housewares and Specialties	17	9.65%	38.10%	3.68%	15.16%	121.80%	18.46%
Human Resource and Employment Services	28	17.55%	44.37%	7.79%	14.62%	26.04%	3.81%
Hypermarkets and Super Centers	6	14.33%	77.66%	11.13%	19.96%	36.53%	7.29%
Independent Power Producers and Energy Traders	15	7.82%	94.51%	7.39%	32.65%	42.92%	14.01%
Industrial Conglomerates	19	4.13%	45.97%	1.90%	18.93%	-67.54%	-12.78%
Industrial Gases	3	12.34%	113.72%	14.04%	23.90%	25.91%	6.19%
Industrial Machinery	86	12.70%	101.59%	12.91%	21.93%	37.46%	8.21%
Industrial REITs	8	3.69%	152.35%	5.62%	12.12%	-166.04%	-20.13%
Insurance Brokers	15	10.02%	66.04%	6.61%	23.60%	35.85%	8.46%
Integrated Oil and Gas	28	24.91%	51.75%	12.89%	28.31%	45.23%	12.80%
Integrated Telecommunication Services	62	9.58%	30.20%	2.89%	17.57%	63.52%	11.16%
Internet Retail	20	7.51%	94.17%	7.07%	5.27%	258.91%	13.65%
Internet Software and Services	126	12.62%	142.44%	17.98%	11.56%	89.74%	10.37%
Investment Banking and Brokerage	44	NA	NA	NA	-0.45%	NA	NA
IT Consulting and Other Services	58	29.56%	47.02%	13.90%	25.44%	17.01%	4.33%

Leisure Facilities	13	7.29%	118.04%	8.60%	2.60%	563.02%	14.66%
Leisure Products	29	10.54%	-23.15%	-2.44%	11.71%	-83.59%	-9.79%
Life and Health Insurance	28	10.14%	-160.25%	-16.25%	13.35%	-195.61%	-26.11%
Life Sciences Tools and Services	58	6.38%	136.31%	8.69%	8.00%	94.86%	7.59%
Managed Healthcare	19	20.14%	13.84%	2.79%	17.70%	-59.85%	-10.60%
Marine	27	12.03%	420.84%	50.61%	31.56%	93.62%	29.55%
Marine Ports and Services	3	11.28%	373.12%	42.09%	20.26%	-24.47%	-4.96%
Metal and Glass Containers	13	11.19%	20.57%	2.30%	65.57%	98.52%	64.60%
Mortgage REITs	37	NA	NA	NA	-42.95%	170.55%	-73.26%
Motorcycle Manufacturers	2	22.71%	-6.82%	-1.55%	32.85%	-45.52%	-14.95%
Movies and Entertainment	32	8.14%	51.46%	4.19%	11.51%	-5.29%	-0.61%
Multi-line Insurance	20	5.01%	256.82%	12.86%	6.65%	295.06%	19.62%
Multi-Sector Holdings	8	-0.20%	-977.58%	1.96%	8.21%	-85.41%	-7.01%
Multi-Utilities	31	6.74%	88.77%	5.98%	18.51%	99.82%	18.47%
Office Electronics	3	17.84%	62.83%	11.21%	16.55%	68.02%	11.26%
Office REITs	18	3.11%	-79.84%	-2.49%	8.89%	-447.43%	-39.79%
Office Services and Supplies	23	12.24%	92.04%	11.26%	15.71%	29.58%	4.65%
Oil and Gas Drilling	19	19.67%	131.51%	25.87%	34.45%	-26.66%	-9.18%
Oil and Gas Equipment and Services	65	19.09%	66.42%	12.68%	28.80%	35.22%	10.15%
Oil and Gas Exploration and Production	164	11.24%	270.48%	30.40%	19.06%	191.77%	36.56%
Oil and Gas Refining and Marketing	27	16.69%	179.96%	30.03%	21.88%	96.43%	21.10%
Oil and Gas Storage and Transportation	73	7.01%	343.73%	24.09%	16.85%	185.13%	31.19%
Other Diversified Financial Services	6	0.06%	3516.26%	2.13%	7.49%	-506.59%	-37.92%
Packaged Foods and Meats	66	12.83%	38.96%	5.00%	22.38%	-35.06%	-7.85%
Paper Packaging	13	5.44%	23.74%	1.29%	19.15%	-42.93%	-8.22%
Paper Products	16	5.44%	8.99%	0.49%	7.77%	-15.57%	-1.21%
Personal Products	34	23.29%	1.22%	0.28%	37.49%	-64.03%	-24.00%
Pharmaceuticals	128	15.35%	63.00%	9.67%	19.83%	6.77%	1.34%
Photographic Products	3	5.91%	160.22%	9.46%	42.31%	214.55%	90.78%
Precious Metals and Minerals	22	6.09%	265.69%	16.18%	3.94%	229.22%	9.04%
Property and Casualty Insurance	77	6.99%	117.38%	8.20%	8.04%	60.20%	4.84%
Publishing	34	9.54%	134.09%	12.79%	8.88%	287.85%	25.57%

Railroads	10	10.82%	53.62%	5.80%	16.24%	5.86%	0.95%
Real Estate Management and Development	38	5.37%	-27.41%	-1.47%	10.83%	-260.75%	-28.24%
Regional Banks	391	NA	NA	NA	8.25%	-412.89%	-34.05%
Reinsurance	18	13.44%	123.10%	16.55%	17.34%	80.51%	13.96%
Residential REITs	20	2.91%	-17.72%	-0.52%	17.15%	-123.95%	-21.25%
Restaurants	62	14.95%	104.32%	15.60%	17.80%	2.92%	0.52%
Retail REITs	29	4.03%	22.13%	0.89%	11.86%	-282.04%	-33.46%
Semiconductor Equipment	61	16.42%	20.11%	3.30%	16.01%	11.27%	1.80%
Semiconductors	119	7.61%	47.84%	3.64%	3.07%	-41.41%	-1.27%
Soft Drinks	19	16.51%	55.95%	9.23%	27.91%	27.99%	7.81%
Specialized Consumer Services	18	11.26%	131.70%	14.84%	1.64%	134.83%	2.21%
Specialized Finance	25	3.26%	378.47%	12.35%	9.45%	-63.94%	-6.04%
Specialized REITs	33	4.99%	158.12%	7.89%	12.94%	-2.09%	-0.27%
Specialty Chemicals	43	10.25%	25.35%	2.60%	14.46%	44.05%	6.37%
Specialty Stores	38	10.06%	14.56%	1.46%	11.45%	5.63%	0.64%
Steel	33	16.64%	110.32%	18.35%	24.56%	33.63%	8.26%
Systems Software	49	29.42%	73.64%	21.66%	30.82%	60.68%	18.70%
Technology Distributors	20	10.36%	31.37%	3.25%	12.59%	10.87%	1.37%
Textiles	6	1.80%	-221.69%	-3.98%	-13.38%	59.93%	-8.02%
Thrifts and Mortgage Finance	188	NA	NA	NA	-11.22%	117.61%	-13.19%
Tires and Rubber	3	17.71%	21.73%	3.85%	175.60%	247.08%	433.88%
Tobacco	11	26.69%	58.38%	15.58%	48.51%	-11.47%	-5.56%
Trading Companies and Distributors	28	7.19%	127.23%	9.14%	20.77%	47.71%	9.91%
Trucking	26	6.10%	992.88%	60.56%	-5.76%	-2262.66%	130.26%
Water Utilities	16	6.76%	96.61%	6.53%	-2.36%	-243.29%	5.73%
Wireless Telecommunication Services	42	9.57%	85.87%	8.22%	6.90%	160.48%	11.07%
Grand Total	6502	5.48%	88.30%	4.84%	14.42%	-18.08%	-2.61%

Table C: Excess Returns by Industry in2 007 – United States

Primary Industry	Number of firms	ROIC	Cost of capital	Excess Retun (capital)	ROE	Cost of Equity	Excess Return (Equity)
Advertising	21	10.90%	6.10%	4.80%	15.26%	6.37%	8.89%
Aerospace and Defense	74	16.98%	7.25%	9.73%	25.00%	7.71%	17.29%
Agricultural Products	12	10.22%	6.78%	3.44%	20.71%	7.35%	13.36%
Air Freight and Logistics	16	19.35%	7.83%	11.52%	8.01%	8.89%	-0.88%
Airlines	26	7.43%	6.75%	0.68%	-264.08%	9.52%	-273.60%
Airport Services	4	3.97%	7.41%	-3.45%	2.31%	7.82%	-5.50%
Alternative Carriers	18	-1.08%	6.54%	-7.62%	-34.70%	7.16%	-41.86%
Aluminum	5	9.91%	6.76%	3.15%	14.14%	7.39%	6.75%
Apparel Retail	51	15.90%	10.26%	5.64%	14.64%	11.13%	3.51%
Apparel, Accessories and Luxury Goods	50	12.75%	7.32%	5.43%	12.06%	7.87%	4.18%
Application Software	127	17.98%	7.59%	10.39%	17.23%	7.77%	9.46%
Asset Management and Custody Banks	949	4.02%	5.47%	-1.44%	10.96%	5.58%	5.38%
Auto Parts and Equipment	41	9.55%	7.63%	1.92%	16.83%	8.90%	7.93%
Automobile Manufacturers	11	4.82%	6.82%	-2.00%	-5.12%	9.06%	-14.18%
Automotive Retail	18	7.94%	7.75%	0.19%	12.30%	9.84%	2.45%
Biotechnology	236	5.32%	7.45%	-2.12%	-1.48%	7.76%	-9.23%
Brewers	7	13.11%	8.05%	5.06%	22.83%	8.76%	14.07%
Broadcasting and Cable TV	55	6.07%	6.68%	-0.61%	2.89%	8.16%	-5.27%
Building Products	26	6.20%	7.67%	-1.47%	4.59%	8.52%	-3.93%
Casinos and Gaming	32	5.44%	7.70%	-2.26%	10.69%	9.65%	1.03%
Catalog Retail	6	4.82%	10.09%	-5.27%	5.11%	11.01%	-5.91%
Coal and Consumable Fuels	24	9.21%	8.06%	1.14%	14.81%	8.65%	6.16%
Commercial Printing	14	10.40%	7.30%	3.09%	5.33%	8.84%	-3.51%
Commodity Chemicals	20	8.80%	6.63%	2.16%	10.02%	8.11%	1.91%
Communications Equipment	136	13.33%	7.64%	5.70%	14.86%	7.98%	6.88%
Computer and Electronics Retail	9	16.88%	9.41%	7.47%	14.11%	9.98%	4.13%
Computer Hardware	19	25.10%	7.23%	17.86%	28.75%	7.32%	21.43%
Computer Storage and Peripherals	47	11.01%	7.20%	3.81%	16.32%	7.34%	8.98%
Construction and Engineering	32	20.56%	8.60%	11.96%	19.67%	9.16%	10.51%
Construction and Farm Machinery and Heavy Trucks	37	10.44%	9.28%	1.16%	25.20%	10.69%	14.51%
Construction Materials	12	10.82%	7.49%	3.32%	18.53%	9.21%	9.32%
Consumer Electronics	17	10.00%	6.51%	3.48%	10.83%	7.21%	3.62%
Consumer Finance	29	1.44%	7.15%	-5.70%	9.93%	9.57%	0.36%
Data Processing and Outsourced Services	42	12.39%	7.37%	5.01%	11.23%	8.24%	2.99%
Department Stores	11	7.34%	8.70%	-1.36%	11.04%	11.84%	-0.80%
Distillers and Vintners	7	12.79%	6.40%	6.39%	22.15%	6.93%	15.22%
Distributors	19	12.06%	7.21%	4.84%	1.96%	8.56%	-6.60%

Diversified Banks	40	0.00%	6.30%	-6.30%	18.54%	7.60%	10.94%
Diversified Capital Markets	4	0.00%	5.40%	-5.40%	-8.25%	8.09%	-16.34%
Diversified Chemicals	14	12.24%	8.05%	4.18%	22.74%	8.95%	13.79%
Diversified Commercial and Professional Services	67	14.19%	7.40%	6.79%	18.97%	7.87%	11.10%
Diversified Metals and Mining	46	24.29%	10.05%	14.23%	39.37%	10.46%	28.90%
Diversified REITs	14	2.95%	7.06%	-4.12%	14.21%	8.60%	5.61%
Drug Retail	6	10.24%	6.56%	3.68%	8.90%	7.86%	1.04%
Education Services	19	33.60%	6.89%	26.70%	22.84%	7.01%	15.83%
Electric Utilities	39	7.14%	6.55%	0.59%	11.51%	7.60%	3.91%
Electrical Components and Equipment	90	15.20%	7.76%	7.44%	20.45%	8.24%	12.21%
Electronic Equipment Manufacturers	103	9.19%	7.60%	1.59%	10.01%	7.94%	2.06%
Electronic Manufacturing Services	38	6.82%	7.91%	-1.09%	-3.01%	8.43%	-11.44%
Environmental and Facilities Services	30	9.22%	7.50%	1.72%	15.47%	8.13%	7.33%
Fertilizers and Agricultural Chemicals	16	20.95%	8.81%	12.15%	31.15%	9.41%	21.74%
Food Distributors	8	18.97%	6.08%	12.89%	27.77%	7.06%	20.71%
Food Retail	16	9.59%	7.13%	2.46%	13.97%	8.41%	5.56%
Footwear	15	23.41%	8.32%	15.08%	23.05%	8.71%	14.34%
Forest Products	5	1.11%	7.41%	-6.30%	-2.98%	8.25%	-11.23%
Gas Utilities	29	8.94%	6.32%	2.62%	16.51%	7.14%	9.37%
General Merchandise Stores	8	12.33%	9.85%	2.48%	16.57%	10.59%	5.98%
Gold	40	5.15%	7.03%	-1.88%	1.62%	7.13%	-5.51%
Health Care Technology	30	13.35%	6.48%	6.87%	28.33%	6.37%	21.96%
Healthcare Distributors	14	13.10%	6.71%	6.39%	17.40%	7.02%	10.38%
Healthcare Equipment	147	11.51%	6.60%	4.91%	9.97%	6.79%	3.18%
Healthcare Facilities	35	7.40%	6.36%	1.04%	13.06%	7.27%	5.79%
Healthcare Services	57	12.09%	6.05%	6.04%	15.71%	6.46%	9.25%
Healthcare Supplies	37	17.92%	6.40%	11.53%	18.54%	6.56%	11.98%
Heavy Electrical Equipment	9	48.01%	7.42%	40.58%	54.54%	7.48%	47.05%
Highways and Railtracks	1	5.30%	5.77%	-0.47%	5.97%	5.23%	0.74%
Home Entertainment Software	17	7.41%	7.51%	-0.11%	3.47%	7.71%	-4.25%
Home Furnishing Retail	10	11.83%	9.89%	1.94%	11.92%	11.20%	0.71%
Home Furnishings	15	5.73%	6.61%	-0.88%	7.11%	7.54%	-0.43%
Home Improvement Retail	4	12.51%	7.62%	4.89%	16.11%	8.59%	7.52%
Homebuilding	30	-0.86%	8.48%	-9.34%	-34.97%	13.62%	-48.59%
Hotels, Resorts and Cruise Lines	26	7.12%	7.30%	-0.18%	12.70%	8.97%	3.73%
Household Appliances	11	12.67%	6.37%	6.30%	20.19%	7.06%	13.13%
Household Products	15	12.80%	6.02%	6.78%	20.05%	7.21%	12.84%
Housewares and Specialties	17	9.65%	7.74%	1.91%	15.16%	9.29%	5.87%
Human Resource and Employment Services	28	17.55%	8.66%	8.89%	14.62%	9.14%	5.47%
Hypermarkets and Super	6	14.33%	8.18%	6.15%	19.96%	8.84%	11.11%

Centers							
Independent Power Producers and Energy Traders	15	7.82%	7.10%	0.72%	32.65%	7.77%	24.88%
Industrial Conglomerates	19	4.13%	7.95%	-3.82%	18.93%	9.07%	9.86%
Industrial Gases	3	12.34%	8.23%	4.11%	23.90%	9.27%	14.63%
Industrial Machinery	86	12.70%	8.15%	4.56%	21.93%	8.73%	13.20%
Industrial REITs	8	3.69%	6.58%	-2.89%	12.12%	7.55%	4.58%
Insurance Brokers	15	10.02%	6.49%	3.53%	23.60%	7.35%	16.26%
Integrated Oil and Gas	28	24.91%	6.82%	18.09%	28.31%	7.26%	21.05%
Integrated Telecommunication Services	62	9.58%	6.37%	3.21%	17.57%	7.31%	10.26%
Internet Retail	20	7.51%	7.66%	-0.15%	5.27%	7.92%	-2.65%
Internet Software and Services	126	12.62%	8.25%	4.37%	11.56%	8.48%	3.08%
Investment Banking and Brokerage	44	0.00%	7.65%	-7.65%	-0.45%	9.17%	-9.62%
IT Consulting and Other Services	58	29.56%	7.02%	22.54%	25.44%	7.44%	18.01%
Leisure Facilities	13	7.29%	7.64%	-0.35%	2.60%	9.08%	-6.47%
Leisure Products	29	10.54%	7.34%	3.20%	11.71%	7.98%	3.73%
Life and Health Insurance	28	10.14%	7.85%	2.29%	13.35%	8.97%	4.38%
Life Sciences Tools and Services	58	6.38%	6.64%	-0.26%	8.00%	6.90%	1.10%
Managed Healthcare	19	20.14%	6.09%	14.05%	17.70%	6.52%	11.18%
Marine	27	12.03%	7.04%	4.99%	31.56%	8.16%	23.40%
Marine Ports and Services	3	11.28%	4.03%	7.25%	20.26%	4.00%	16.26%
Metal and Glass Containers	13	11.19%	7.58%	3.61%	65.57%	9.01%	56.56%
Mortgage REITs	37	0.00%	5.99%	-5.99%	-42.95%	9.27%	-52.22%
Motorcycle Manufacturers	2	22.71%	7.03%	15.68%	32.85%	7.51%	25.34%
Movies and Entertainment	32	8.14%	7.02%	1.12%	11.51%	8.34%	3.17%
Multi-line Insurance	20	5.01%	6.91%	-1.91%	6.65%	8.23%	-1.58%
Multi-Sector Holdings	8	-0.20%	8.17%	-8.37%	8.21%	9.54%	-1.33%
Multi-Utilities	31	6.74%	6.60%	0.15%	18.51%	7.62%	10.89%
Office Electronics	3	17.84%	6.47%	11.37%	16.55%	7.30%	9.25%
Office REITs	18	3.11%	7.68%	-4.57%	8.89%	9.75%	-0.86%
Office Services and Supplies	23	12.24%	7.58%	4.66%	15.71%	8.84%	6.87%
Oil and Gas Drilling	19	19.67%	7.12%	12.55%	34.45%	7.55%	26.90%
Oil and Gas Equipment and Services	65	19.09%	7.79%	11.30%	28.80%	8.21%	20.59%
Oil and Gas Exploration and Production	164	11.24%	5.95%	5.29%	19.06%	6.16%	12.90%
Oil and Gas Refining and Marketing	27	16.69%	7.21%	9.47%	21.88%	8.18%	13.70%
Oil and Gas Storage and Transportation	73	7.01%	5.76%	1.25%	16.85%	6.15%	10.70%
Other Diversified Financial Services	6	0.06%	6.16%	-6.09%	7.49%	9.93%	-2.45%
Packaged Foods and Meats	66	12.83%	6.66%	6.17%	22.38%	7.14%	15.24%
Paper Packaging	13	5.44%	6.83%	-1.40%	19.15%	9.53%	9.63%

Paper Products	16	5.44%	7.30%	-1.86%	7.77%	9.10%	-1.32%
Personal Products	34	23.29%	6.55%	16.74%	37.49%	6.93%	30.56%
Pharmaceuticals	128	15.35%	7.01%	8.34%	19.83%	7.26%	12.56%
Photographic Products	3	5.91%	5.94%	-0.03%	42.31%	5.62%	36.69%
Precious Metals and Minerals	22	6.09%	8.78%	-2.69%	3.94%	9.07%	-5.13%
Property and Casualty Insurance	77	6.99%	7.02%	-0.03%	8.04%	7.81%	0.23%
Publishing	34	9.54%	6.86%	2.68%	8.88%	7.77%	1.12%
Railroads	10	10.82%	7.94%	2.88%	16.24%	9.08%	7.16%
Real Estate Management and Development	38	5.37%	6.29%	-0.92%	10.83%	6.76%	4.07%
Regional Banks	391	0.00%	6.14%	-6.14%	8.25%	7.24%	1.01%
Reinsurance	18	13.44%	6.25%	7.20%	17.34%	6.96%	10.38%
Residential REITs	20	2.91%	7.13%	-4.22%	17.15%	8.65%	8.49%
Restaurants	62	14.95%	7.91%	7.05%	17.80%	9.12%	8.68%
Retail REITs	29	4.03%	7.76%	-3.72%	11.86%	9.65%	2.21%
Semiconductor Equipment	61	16.42%	8.48%	7.94%	16.01%	9.00%	7.01%
Semiconductors	119	7.61%	8.28%	-0.67%	3.07%	8.63%	-5.56%
Soft Drinks	19	16.51%	6.79%	9.71%	27.91%	7.46%	20.44%
Specialized Consumer Services	18	11.26%	7.42%	3.84%	1.64%	8.32%	-6.69%
Specialized Finance	25	3.26%	7.17%	-3.91%	9.45%	8.61%	0.84%
Specialized REITs	33	4.99%	7.79%	-2.80%	12.94%	9.22%	3.72%
Specialty Chemicals	43	10.25%	8.19%	2.06%	14.46%	9.15%	5.31%
Specialty Stores	38	10.06%	7.76%	2.29%	11.45%	9.17%	2.28%
Steel	33	16.64%	8.23%	8.41%	24.56%	8.84%	15.72%
Systems Software	49	29.42%	7.12%	22.30%	30.82%	7.28%	23.54%
Technology Distributors	20	10.36%	7.38%	2.98%	12.59%	8.06%	4.53%
Textiles	6	1.80%	4.75%	-2.96%	-13.38%	4.75%	-18.13%
Thrifts and Mortgage Finance	188	-0.15%	5.71%	-5.86%	-11.22%	6.72%	-17.94%
Tires and Rubber	3	17.71%	8.98%	8.73%	175.60%	11.48%	164.12%
Tobacco	11	26.69%	4.85%	21.85%	48.51%	5.50%	43.01%
Trading Companies and Distributors	28	7.19%	7.67%	-0.48%	20.77%	8.62%	12.15%
Trucking	26	6.10%	8.09%	-2.00%	-5.76%	9.71%	-15.47%
Water Utilities	16	6.76%	6.14%	0.63%	-2.36%	6.41%	-8.77%
Wireless Telecommunication Services	42	9.57%	7.48%	2.09%	6.90%	8.34%	-1.44%
Grand Total	6502	5.48%	6.87%	-1.40%	14.42%	7.54%	6.89%