tial magnitude of the problem, in this section, we replicate some of our tests on firms who do not survive over the entire future horizon.

Specifically, we examine two sets of stocks. Given our focus on long-horizon growth, we first select at each year-end a sample of firms who survive over the full 10-year following period. The behavior of these (the survivors) is compared to a second set (the nonsurvivors) that also includes firms who do not last for the full period. To strike a balance between the mix of survivors and nonsurvivors in this second set, we require firms to survive for the first five years after sample selection, but they may drop out between the 6th to 10th year of the postselection period.

The results are reported in Panels A and B of Table VII. The survivors have a higher chance than expected for achieving runs above the median in growth of income before extraordinary items. Conversely, the fraction of runs is lower for the set of nonsurvivors. Of the survivors, for example, 3.4 percent sustain runs for five years of growth in income before extraordinary items above the median (where the expected proportion is 3.1 percent). The corresponding percentage for nonsurvivors is 2.3 percent. Nonetheless, the differences across the two sets are generally not substantial. Panels C and D apply the same procedure to the technology stocks considered in Table IV. Here the differences across the two sets are more notable. At the five-year horizon, for example, 5.2 percent of the survivors achieve runs above the median for growth in income before extraordinary items, compared to 3.2 percent of the nonsurvivors.

Finally, Panels A and B of Part II of Table VII give the distribution of one-year growth rates for the two sets of firms (where the percentiles are averaged across all sample selection years). The results confirm that survivors realize higher growth rates than nonsurvivors. For example, the median growth in income before extraordinary items for the survivors averages 10.6 percent, compared to 8.2 percent for nonsurvivors.

V. The Predictability of Growth: Valuation Ratios

Based on the historical record, it is not out of the question for a firm to enjoy strong growth in excess of 20 percent a year for prolonged periods. The issue, however, is whether such firms are identifiable ex ante. Our attempts in the previous sections to uncover cases of persistently high future growth using information such as past growth, industry affiliation, value–glamour orientation, and firm size have limited success. In this section, we expand our search for predictability by investigating whether valuation indicators such as earnings-to-price, book-to-market, and sales-to-price ratios distinguish between firms with high or low future growth. Further, several studies suggest that investors are prone to judgmental biases, so they respond to past growth by extrapolating performance too far into the future (see, e.g., La Porta (1996) and La Porta et al. (1997)). Consequently, after a period of above- or below-average growth, the valuations of firms with high (low) realized growth may be pushed too high (or too low).

In Table VIII, stocks are sorted into deciles at each year-end on the basis of their growth rate in income before extraordinary items over the following five years (Panel A) or over the following 10 years (Panel B). Within each decile, we

Table VII

Results for Surviving versus Non-Surviving Firms: Persistence Tests and Growth Rates

At every calendar year-end over the sample period, two sets of firms are selected: firms that survive over the following ten years (survivors), and firms that survive over the following five years but thereafter fail to survive until the tenth year (nonsurvivors). For each set of firms, growth rates in operating performance are calculated over each of the following ten years. The sample period is 1951 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Part I provides runs tests of persistence over each of the following ten years for the two sets of firms: the average number of firms whose growth rate exceeds the median growth rate each year for the indicated number of years is expressed as a percentage of the number of firms with valid growth rates. Part II reports the distribution of annualized growth rates realized over the sixth to tenth year (or until delisting) following sample selection for the two sets of firms. The simple average over the entire sample period of the percentiles is reported.

Part I: Runs Tests for Persistence

	Percent of Firms with Above-Median Growth each Year for Number of Years:									
Variable	1	2	3	4	5	6	7	8	9	10
				(A) Survivors (1265 firms)						
Sales	52.8	30.9	18.1	10.8	6.6	4.2	2.7	1.8	1.3	0.9
Operating Income before Depreciation	51.5	26.8	13.7	7.0	3.8	2.1	1.2	0.7	0.5	0.3
Income before Extraordinary Items	51.7	26.9	13.5	6.7	3.4	1.8	1.0	0.5	0.3	0.2
				(B) Non-Survivors						
Number of Firms	445	445	445	445	445	344	250	165	86	0
Sales	48.7	26.6	14.6	8.1	4.5	2.8	1.7	1.1	0.8	—
Operating Income before Depreciation	50.0	24.2	11.5	5.5	2.5	1.3	0.7	0.5	0.3	—
Income before Extraordinary Items	49.1	23.8	11.1	5.1	2.3	1.1	0.6	0.3	0.1	—
				(C) Survivors, Technology (195 firms)						
Sales	54.6	33.2	20.5	12.9	8.4	5.8	4.2	3.0	2.3	1.7
Operating Income before Depreciation	53.6	29.7	16.5	9.6	5.9	3.6	2.2	1.4	1.0	0.7
Income before Extraordinary Items	54.1	29.9	16.3	9.0	5.2	3.1	1.9	1.1	0.6	0.4

					(D) Non-Survivors, Technology					
Number of Firms	100	100	100	100	100	77	55	37	20	0
Sales	51.5	28.6	16.7	10.6	6.5	4.6	3.1	2.0	1.4	—
Operating Income before Depreciation	49.5	24.3	12.4	6.6	3.3	2.0	1.4	1.3	1.0	—
Income before Extraordinary Items	50.1	25.0	12.4	6.7	3.2	1.7	1.0	0.5	0.0	—
Expected Percent above Median	50.0	25.0	12.5	6.3	3.1	1.6	0.8	0.4	0.2	0.1

Part II: Annualized Growth Rates

	Percentile									
Variable	2%	10%	25%	40%	50%	60%	75%	95%	98%	
					(A) Survivors					
Sales	−15.4	−2.0	5.6	9.1	10.9	12.5	15.5	21.7	37.6	
Operating Income before Depreciation	−23.3	−6.8	2.8	7.6	10.1	12.5	16.9	25.5	48.0	
Income before Extraordinary Items	−28.6	−8.6	2.1	7.7	10.6	13.3	18.1	28.4	56.4	
					(B) Non-Survivors					
Sales	−18.5	−7.0	1.0	6.0	8.4	10.4	13.9	20.3	36.8	
Operating Income before Depreciation	−26.1	−12.5	−2.6	4.7	8.1	11.5	16.3	25.7	47.9	
Income before Extraordinary Items	−27.4	−14.5	−3.3	4.4	8.2	11.9	17.9	28.6	55.9	–

Table VIII

Valuation Ratios and Characteristics at Beginning and End of Horizon for Firms Classified by Growth in Income before Extraordinary Items

At every calendar year-end over the sample period, growth rates in income before extraordinary items available to common equity are calculated over the following five and ten years for all firms in the sample. The sample period is 1951 to 1998, and the sample includes all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files. Growth rates are measured on a per share basis as of the sample selection date, with the number of shares outstanding adjusted to reflect stock splits and dividends; cash dividends and special distributions are also reinvested. Firms are classified into one of ten equally-sized categories based on their realized five- and ten-year growth rates. The following statistics are calculated for firms within each category: the median realized annual growth rate over the horizon; the average size decile rank at the beginning and end of the growth horizon; median valuation ratios at the beginning and at the end of the horizon. The ratios are the prior year's income before extraordinary items to price (*EP*), net sales to price (*SP*), and book value to market value of common equity (*BM*). Results are averaged over all years in the sample period, and are also reported for the last five- or 10-year period. Panel A of the table provides results for firms classified by growth rates over five years and for firms with above-median growth each year for five consecutive years; Panel B provides results for firms classified by ten-year growth rates.

Panel A: Classified by Annualized Growth Rate over 5 Years

Variable	Decile 1	2	3	4	5	6	7	8	9	10	5-year run above median
Median Growth Rate	−18.9	−5.0	1.5	5.8	9.1	12.0	15.1	18.9	25.1	41.7	40.9
Beginning Size Decile Rank	4.118	4.773	5.087	5.423	5.447	5.526	5.338	4.989	4.273	3.272	3.699
Ending Size Decile Rank	3.526	4.414	4.831	5.275	5.452	5.668	5.652	5.482	5.056	4.243	5.163
Beginning Median EP Ratio	0.083	0.085	0.086	0.083	0.084	0.082	0.082	0.082	0.079	0.068	0.061
At Start of Last 5-year Period	0.050	0.056	0.059	0.055	0.060	0.055	0.052	0.047	0.037	0.021	0.033
Ending Median EP Ratio	0.055	0.073	0.078	0.080	0.082	0.081	0.080	0.079	0.077	0.075	0.066
At End of Last 5-year Period	0.033	0.047	0.052	0.053	0.052	0.052	0.049	0.050	0.046	0.042	0.040
Beginning Median BM Ratio	0.650	0.654	0.678	0.665	0.685	0.679	0.694	0.726	0.777	0.880	0.694
At Start of Last 5-year Period	0.465	0.485	0.476	0.465	0.494	0.430	0.458	0.437	0.452	0.537	0.446
Ending Median BM Ratio	1.115	0.927	0.845	0.789	0.755	0.700	0.669	0.610	0.574	0.560	0.369
At End of Last 5-year Period	0.549	0.495	0.501	0.461	0.402	0.367	0.350	0.337	0.291	0.292	0.200
Beginning Median SP Ratio	1.723	1.576	1.473	1.304	1.370	1.276	1.328	1.530	1.791	2.323	1.684
At Start of Last 5-year Period	0.962	1.022	1.079	0.825	0.890	0.807	0.822	1.065	1.052	1.423	0.914
Ending Median SP Ratio	2.606	2.062	1.783	1.501	1.422	1.288	1.274	1.305	1.377	1.503	1.012
At End of Last 5-year Period	1.174	0.860	0.972	0.638	0.653	0.587	0.573	0.649	0.563	0.681	0.460

Table VIII—*continued*

Panel B: Classified by Annualized Growth Rate over 10 years

Median Growth Rate	−10.8	−3.4	−0.3	2.1	3.9	5.6	7.4	9.4	12.4	19.3
Beginning Size Decile Rank	4.565	5.223	5.577	5.641	5.597	5.508	5.563	5.480	5.040	3.890
Ending Size Decile Rank	3.950	5.087	5.608	5.818	5.882	5.921	5.981	6.100	5.851	5.100
Beginning Median EP Ratio	0.088	0.088	0.087	0.087	0.087	0.086	0.085	0.081	0.080	0.069
At Start of Last 10-year Period	0.072	0.070	0.077	0.073	0.074	0.065	0.068	0.066	0.056	0.039
Ending Median EP Ratio	0.057	0.072	0.076	0.079	0.081	0.083	0.084	0.082	0.082	0.079
At End of Last 10-year Period	0.035	0.047	0.050	0.053	0.048	0.054	0.056	0.049	0.044	0.049
Beginning Median BM Ratio	0.653	0.699	0.696	0.699	0.726	0.707	0.723	0.706	0.742	0.817
At Start of Last 10-year Period	0.550	0.605	0.548	0.564	0.595	0.543	0.609	0.504	0.597	0.724
Ending Median BM Ratio	1.048	0.860	0.796	0.761	0.748	0.734	0.725	0.673	0.647	0.622
At End of Last 10-year Period	0.626	0.482	0.382	0.439	0.392	0.396	0.409	0.321	0.343	0.337
Beginning Median SP Ratio	1.664	1.560	1.470	1.392	1.429	1.399	1.415	1.408	1.503	2.022
At Start of Last 10-year Period	1.405	1.417	1.164	1.285	1.054	1.106	1.211	1.133	1.455	1.409
Ending Median SP Ratio	2.619	1.928	1.648	1.531	1.535	1.477	1.478	1.411	1.385	1.468
At End of Last 10-year Period	1.520	0.941	0.735	0.853	0.758	0.826	0.805	0.664	0.724	0.756

calculate the median realized growth rate, as well as median characteristics such as size decile rank and valuation ratios. This is done at the beginning of the 5- or 10-year growth horizon and also at the end of the horizon. We report results averaged across all sample selection years, as well as results for the most recent 5-year or 10-year growth horizon in our sample period.

We focus the discussion on Panel A of the table (the results are similar for the 10-year horizon). In line with the results from Tables I and II, the stocks in the extreme growth deciles tend to be smaller firms. The median firm in the top decile (with a growth rate of 41.7 percent a year) falls in the third size decile, while the median firm in the bottom decile (with a growth rate of −18.9 percent) ranks in the fourth size decile. Over the following 5 years, however, the high-growth firms perform relatively well, resulting in a surge in their market values. Conversely, the market values of the low-growth firms show a relative slump.

Sorting by realized future growth induces a mechanical association between growth rates and the level of earnings at the beginning and end of the growth horizon. To weaken this link, we measure earnings one year prior to the base year (or one year before the final year) of the growth horizon. The price is measured at the start or end of the horizon, so the numbers correspond to the conventional measure of trailing earnings yield that is widely used in practice and research. There is reason to be wary about relying too heavily on the earnings yield variable, however, because net income is the most problematic of our measures of operating performance. For example, a firm may have a low earnings yield because its price impounds investors' expectations of high growth in future earnings, but another reason may be its recent performance has been poor and its earnings are currently depressed. On this account, earnings-to-price ratios are not generally used in academic research, or investment industry analysis, to classify firms as "value" or "glamour" stocks. Instead other, better-behaved, indicators such as the book-to-market ratio, are favored.

The top decile of growth firms at the beginning of the growth horizon has a median earnings-price ratio (0.068) that is much lower than the others (which cluster around 0.08). The low earnings yield for this group is consistent with the notion that the market's valuation accurately incorporates future growth. On the other hand, decile portfolios 8 and 9, which also show relatively strong growth, do not have notably low earnings yields. Rather, the association for the highest-growth decile may reflect cases where firms grow from a depressed level of income. At the end of the growth horizon, only the earnings-price ratio of the bottom decile of firms is eye-catching. Contrary to intuition, however, these firms have comparatively low earnings yields so they appear to be relatively "expensive." Instead, the explanation here may also lie in their low earnings levels, since they have gone through a period of disappointing growth.

Given the shortcomings of the earnings yield variable, we also look at valuation measures that tend to be better-behaved. Table VIII provides median ratios of book-to-market and sales-to-price at the beginning and end of the growth horizon for each decile. Firms which are ranked in the highest decile by earnings growth have relatively high sales-to-price and book-to-market ratios at the beginning. For example, their median book-to-market ratio is 0.880 (compared to 0.690

averaged across the other groups) and the median sales-to-price multiple is 2.323 (compared to 1.486 for the other groups). The modest ex ante valuations suggest that the market fails to anticipate their subsequent growth.

On the other hand, ex post valuations closely track prior growth. The top decile of high-growth firms have ending book-to-market and sales-to-price ratios of 0.560 and 1.503, respectively. These are substantially lower than the averages across all the other groups. This finding fits in with earlier evidence on the existence of extrapolative biases in investors' expectations about future growth (see La Porta (1996) and La Porta et al. (1997)).

The last column in Panel A of Table VIII provides corresponding statistics for firms whose income before extraordinary items grows above the median rate for five consecutive years. The difference between these firms' valuation ratios at the beginning and end of the growth horizon is striking. At the beginning, their book-to-market and sales-to-price ratios are not too far out of line from the average, suggesting that their future performance is not foreseen by the market. However, at the end of the growth horizon, the median book-to-market and sales-to-price ratios of this group are the lowest in Table VIII. The rich ending multiples such firms command highlight the importance investors attach to consistently superior growth, and not just high growth per se. Investors handsomely reward firms that have achieved several consecutive years of strong growth, and believe they will continue the streak (counterfactually, as the results in Table V indicate).

In summary, the results suggest that market valuation ratios have little ability to sort out firms with high future growth from firms with low growth. Instead, in line with the extrapolative expectations hypothesis, investors tend to key on past growth. Firms that have achieved high growth in the past fetch high valuations, while firms with low past growth are penalized with poor valuations.

VI. Comparisons with IBES Consensus Forecasts

Security analysts' estimates of near-term earnings are widely disseminated and receive much attention. Dramatic movements in a stock's price can arise when an influential analyst issues a revised earnings estimate. Possibly, therefore, analysts' estimates of long-term earnings growth may also be useful in forecasting future growth over longer horizons. Analysts are not shy about making aggressive growth forecasts either (the dispersion between the top and bottom decile of IBES long-term forecasts is about 31 percent), so they apparently are confident in their own ability to pick the future success stories.

The current dividend yield on a stock may also have predictive power for future growth in earnings per share. Standard textbook analysis suggests that, given a firm's investment policy and ignoring tax effects, it is a matter of indifference to a shareholder whether earnings are paid out as current dividends or retained for growth in future dividends. For example, a firm may choose to raise the amount paid out from earnings as dividends to current shareholders. To maintain investment, however, it must use external financing, thereby diluting current shareholders' claims to future profits. In other words, high current dividends come at the expense of low future growth per share. To use a simple constant-growth

dividend discount model as an illustration, given investors' required rate of return, there is a one-to-one trade-off between future growth per share and the dividend yield. Furthermore, a firm's dividend payout may signal whether it has attractive investment projects available to fuel future growth.

To allow a cleaner comparison with analysts' forecasts, which do not include dividends, in the remainder of the paper, we drop our convention of reinvesting dividends when we calculate growth rates. Analysts' predictions refer to growth in income before extraordinary items, but realized growth in this variable is highly prone to measurement problems (such as the exclusion of cases with negative base-year values for income). For this reason, we also report realized growth in sales and operating income before depreciation. Growth rates in these variables are correlated with growth in income before extraordinary items, but are better behaved and are available for a much larger fraction of the sample.

A. *Individual Firm Growth Rates*

Table IX relates IBES consensus long-term growth forecasts to realized future growth. At each year-end, we rank all domestic firms with available IBES long-term forecasts and sort them into quintiles. IBES long-term estimates do not become available until 1982, so the sample period in Table IX runs from 1982 to 1998. The breakpoints for the sort use all NYSE firms available as of the sample selection date (regardless of whether they survive in the future). In Table IX, we track the subsequent growth rates of firms who survive over the next one, three, or five years in each quintile. The median realized growth rate over firms in each quintile is then averaged across all sample selection dates.

The dispersion in IBES consensus growth forecasts is large, so analysts are boldly distinguishing between firms with high and low growth prospects. The median estimate in quintile 1 averages 6 percent, while the median estimate in quintile 5 is 22.4 percent on average.[9] Notably, analysts' estimates are quite optimistic. Over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items.[10]

Near-term realized growth tends to line up closely with the IBES estimate (Panel A). In the first postranking year, the median growth rate in income before extraordinary items is 18.3 percent on average for quintile 5, and 5.1 percent on average for quintile 1. The difference between the growth rates for the other quintile portfolios is much milder, however. Comparing quintiles 4 and 2, median growth rates in income before extraordinary items are apart by only 2.5 percent.

A naive model for predicting future growth uses the dividend yield, and is based on the trade-off between current dividends and future growth. Suppose,

[9] Note that since the breakpoints are based on NYSE stocks only, the number of stocks differs across the quintiles. In particular, many firms penetrate the top quintile.

[10] To sharpen the point, note that the median realized growth rate of nine percent (without dividends reinvested) is based on all firms, including smaller firms that tend to be associated with somewhat higher growth rates. IBES forecasts, on the other hand, predominantly cover larger firms.

Table IX

Realized Median Growth Rates of Operating Performance for Stocks Classified by IBES Long-Term Growth Forecasts

At every calendar year-end t over the sample period, stocks are ranked and classified to one of five groups based on IBES forecasts of long-term earnings growth. Results are reported for individual stocks and for portfolios. For individual stocks, growth rates in operating performance are calculated over each of the five subsequent years (years $t+1$ to $t+5$) for all firms in the sample with available data. The sample period is 1982 to 1998, and all domestic firms listed on the New York, American, and Nasdaq markets with data on the Compustat files are eligible. Operating performance is measured as sales, operating income before depreciation, or income before extraordinary items available to common equity. Growth in each variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. The median realized growth over all stocks in each classification is calculated each year, and the simple average over the entire sample period is reported. For portfolios, a value-weighted portfolio is formed at each year-end from all the stocks in each quintile sorted by IBES forecasts. The portfolio's income before extraordinary items is calculated over each of the subsequent five years, with the proceeds from liquidating delisted stocks reinvested in the surviving stocks. Growth rates for each portfolio are calculated in each formation year, and the simple average over the entire sample period of the growth rates is reported. Also reported are the ratios of the prior year's income before extraordinary items per share to current price, and the prior year's cumulative regular dividends per share to current price.

	Quintile Based on IBES Forecast:				
Growth in:	1 (Low)	2	3	4	5 (High)
(A) Growth Rate in Year t+1					
Sales	1.4	4.5	6.3	8.3	13.7
Operating Income before Depreciation	3.6	6.8	7.6	10.3	16.0
Income before Extraordinary Items	5.1	9.5	10.1	12.0	18.3
Portfolio Income before Extraordinary Items	12.6	4.2	4.5	7.2	13.6
No. with Positive Base & Survive 1 year	242	256	266	318	584
No. with Negative Base & Survive 1 year	71	78	60	88	265
(B) Growth Rate in Year t+2					
Sales	1.7	4.5	6.4	7.8	11.6
Operating Income before Depreciation	3.2	7.0	8.4	9.9	14.0
Income before Extraordinary Items	4.7	9.9	10.5	12.2	16.4
Portfolio Income before Extraordinary Items	6.9	7.5	6.1	9.1	10.6
No. with Positive Base & Survive 2 years	225	235	244	296	497
No. with Negative Base & Survive 2 years	62	75	59	85	252
(C) Annualized Growth Rate over 3 Years					
Sales	1.1	4.0	5.6	7.3	11.3
Operating Income before Depreciation	2.5	5.2	6.8	8.1	10.9
Income before Extraordinary Items	3.1	7.4	7.0	9.0	11.5
Portfolio Income before Extraordinary Items	9.0	7.3	5.2	7.1	11.4
No. with Positive Base & Survive 3 years	202	209	230	263	439
No. with Negative Base & Survive 3 years	67	70	56	82	217
(D) Annualized Growth Rate over 5 Years					
Sales	1.2	3.4	5.1	6.9	9.9
Operating Income before Depreciation	2.2	5.1	6.8	7.3	9.2
Income before Extraordinary Items	2.0	6.5	6.5	8.0	9.5
Portfolio Income before Extraordinary Items	8.0	10.7	7.2	7.7	11.3
No. with Positive Base & Survive 5 years	182	179	201	233	356
No. with Negative Base & Survive 5 years	57	63	50	68	170
Median IBES Forecast	6.0	10.2	12.3	15.1	22.4
Median Stock Dividend Yield, %	6.0	3.4	2.7	1.5	0.1
Portfolio Dividend Yield, %	6.9	4.6	3.3	2.5	1.3
Median Stock Earnings to Price Ratio, %	10.0	8.9	7.9	7.2	5.6

as a first approximation, that all stocks have the same long-term expected return. Given this, the naive model forecasts a spread in future growth across stocks that is identical to the spread in their current dividend yields (but in the opposite direction). The naive forecast is quite successful at picking up differences in growth across the intermediate quintiles. Over the first postranking year, the difference between the dividend yields of quintiles 2 and 4 (3.4 and 1.5 percent, respectively) corresponds roughly to the difference in their growth rates. Once differences in the dividend yield are taken into account, then, IBES estimates have forecast power for realized growth over the first year only at the extremes.

In general, IBES long-term forecasts refer to a three- to five-year horizon, so the behavior of realized growth over these horizons is more interesting. Median realized growth rates over three years and over five years are reported in Panels C and D. These panels highlight the upward bias in analysts' long-term growth estimates. In every quintile, median forecasts exceed median realized growth rates, with the most pronounced bias in quintile 5. For five-year growth in income before extraordinary items, for example, the median forecast in the top quintile is 22.4 percent, much higher than the median realized growth rate, which is only 9.5 percent. Furthermore, the realized growth rate for the firms in the top quintile should be taken with a grain of salt. In the highest-ranked quintile, the percentage of firms who survive for the full five postranking years is lower than for any of the other quintiles. For example, there are 849 firms on average who survive in the first postranking year in quintile 5, but this drops to 526 by the fifth year, so about 38 percent of the firms drop out between the first and fifth years. For quintile 3, the corresponding counts are 326 and 251, respectively, so 23 percent disappear from the sample. The upshot is that realized growth in income before extraordinary items is likely to be somewhat overstated for firms in the top quintile.

Over longer horizons, analysts' growth estimates still do not add much information beyond what is contained in the dividend yield. For example, the median realized five-year growth rate is 9.5 percent for the highest-ranked quintile by IBES forecasts, compared to 2 percent for the lowest-ranked quintile. The difference of 7.5 percent is not much higher than the spread in their dividend yields. The yields are 0.1 percent and 6 percent for the highest and lowest ranked quintiles, respectively, so the dividend yield spread is 5.9 percent. The results for growth in operating income before depreciation yield similar conclusions.

To sum up, analysts forecast that long-term earnings growth for the top quintile outperforms the bottom quintile by 16.4 percent. The realized gap in five-year growth rates, however, is only 7.5 percent. Much of the spread in realized growth reflects differences in dividend yields, and some is due to survivorship bias in the top quintile. After accounting for these influences, analyst forecasts add information only over shorter horizons.

B. Portfolio Growth Rates

Issues of survivorship bias and low or negative base-year values for income before extraordinary items are major concerns. Table IX takes another approach to measuring growth rates that tries to work around these concerns. Specifically,

after ranking stocks by IBES long-term forecasts at each year-end, we form a value-weighted portfolio of the stocks in each quintile. Value-weighting affords some degree of robustness to our measures, to the extent that problems in measuring growth are less severe for large companies. We then track over the postformation period the income before extraordinary items of the portfolio as a whole. If a stock is delisted in a year after portfolio formation, we assume it generates the average income of the remaining firms in that year. Then, at the end of the year, we take the proceeds from liquidating nonsurviving firms and reallocate them proportionally across the surviving stocks. As a result, we are able to use all eligible companies to calculate growth rates, regardless of whether they survive over the full growth horizon, or whether they have positive earnings in the base year.[11] The portfolio approach, however, is not without its drawbacks. As firms drop out of the sample and the funds from their liquidation are reinvested in the remaining firms, over time, the portfolio can build up large stakes in a relatively small number of surviving firms who tend to have relatively high growth rates. The implication is that long-term portfolio growth rates for cases where survivorship bias is acute, such as the fastest-growing firms in the top quintile by IBES forecasts as noted above, should be interpreted with caution.

The results for the portfolios' long-term growth rates are in line with our earlier findings. IBES long-term forecasts are essentially unrelated to realized growth in income before extraordinary items beyond one or two years out. For example, over the five postformation years (Panel D), the bottom and top quintile portfolios on average experience growth rates of 8 and 11.3 percent per year, respectively. The spread of 3.3 percent in the portfolios' growth rates is smaller than the gap between their dividend yields (5.6 percent).

One difference between our results for individual stocks' growth rates and the portfolios' growth rate concerns the performance of the bottom quintile in the first postranking year. In the year immediately following portfolio formation, the bottom quintile portfolio experiences a strong recovery. Its short-term growth rate (12.6 percent) falls slightly short of the top quintile portfolio's growth rate (13.6 percent). This difference from the earlier results based on individual stocks reflects several methodological details, specifically the use of value-weights, the inclusion in the portfolios of nonsurviving firms as well as firms with negative income, and the use of a time-series average of the yearly portfolio growth rates rather than the cross-sectional medians. In particular, since firms with low IBES forecasts generally tend to start with low or negative values of income before extraordinary items at the portfolio formation date, the growth rate over the following year is likely to be high.[12]

Analysts' forecasts substantially overstate realized long-term growth in the top three quintile portfolios. In the top-ranked quintile, for example, the median projected future growth rate is about 22.4 percent, but the portfolio's realized

[11] The portfolio approach to measuring growth rates is described further in Chan et al. (2000, 2001).

[12] Our results parallel the findings for the prospective earnings growth of beaten-down value stocks documented in Lakonishok et al. (1994).

growth is only 11.4 percent over three years and 11.3 percent over five years. These results suggest that, in general, caution should be exercised before relying too heavily on IBES long-term forecasts as estimates of expected growth in valuation studies. The bottom quintile portfolios by IBES forecasts predominantly comprise firms in mature industries whose growth prospects are relatively unexciting, so analysts' estimates come closer to the mark here. For instance, about 25 percent of the firms in the first quintile are utilities.

The long-term estimates of analysts may be overly optimistic for several reasons. One explanation draws on evidence from studies in psychology that individuals' forecasts are susceptible to cognitive biases.[13] For example, the confirmation bias suggests that individuals tend to focus on evidence that supports their beliefs, while downplaying other information that is inconsistent. In this regard, analysts' estimates will be particularly bullish for glamour stocks that have shown strong past growth and which enjoy favorable investor sentiment. In addition, an analyst is employed by a brokerage firm and is expected to make contributions beyond predicting earnings. Up-beat forecasts may encourage trading by investors and thereby raise commission income, as well as generate investment banking business from firms that receive favorable coverage. The general perception is that these aspects of the brokerage and investment banking business are larger, and their links to analysts closer, in the U.S. market than overseas. As one piece of evidence that such considerations may lead to inflated forecasts, IBES estimates as of mid-2001 for U.S. companies project long-term growth of about 18 percent on average. At the same time, in non-U.S. markets, analysts are forecasting long-term growth for companies of roughly the same size to average 11 percent. Perhaps the close ties that exist in practice between the brokerage and investment banking businesses in the U.S. market foster an environment where analysts tend to be less impartial and err on the side of optimism.

VII. Regression Models

We close out our analysis by gathering all the variables we have previously considered individually into one model in order to take our best shot at forecasting growth. Table X reports the results from cross-sectional regressions to predict future growth in operating profits. The model is

$$\begin{aligned} y_{it+j} = {} & \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} \\ & + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} \\ & + \varepsilon_{it+j}. \end{aligned} \tag{1}$$

The dependent variable, y_{it+j}, is the rate of growth for firm i over year $t+j$ in sales (SALES), operating income before depreciation (OIBD), or income before extraordinary items available to common equity (IBEI). We forecast growth over the first year following sample selection, over the three and five years subsequent to sample selection, and over the second to fifth subsequent years.

[13] The evidence is discussed in Kahnemann and Riepe (1998) and Fisher and Statman (2000).

Table X

Forecasting Regressions for Growth Rates of Operating Performance

At every calendar year-end, a cross-sectional regression model is used to forecast growth rates of operating performance, y_{it+j} for firm i over the following one to five years for all firms in the sample with available data. The model is.

$$y_{it+j} = \beta_0 + \beta_1 PASTGS5_{it} + \beta_2 EP_{it-1} + \beta_3 G_{it-1} + \beta_4 RDSALES_{it} + \beta_5 TECH_{it} + \beta_6 BM_{it} + \beta_7 PASTR6_{it} + \beta_8 IBESLTG_{it} + \beta_9 DP_{it} + \varepsilon_{it+j}.$$

The dependent variable is growth in: sales (SALES); operating income before depreciation (OIBD); or income before extraordinary items available to common equity (IBEI). The variables used to forecast a firm's growth are *PASTGS5*, the growth in sales over the five years prior to the sample selection date; *EP*, the ratio of income before extraordinary items available to common equity to equity market value; *G*, the sustainable growth rate given by the product of return on equity (income before extraordinary items available to common equity relative to book equity) and plowback ratio (one minus the ratio of total dividends to common equity to income before extraordinary items available to common equity); *RDSALES*, the ratio of research and development expenditures to sales; *TECH*, a dummy variable with a value of one for a stock in the technology sector and zero otherwise; *BM*, book-to-market ratio; *PASTRGs*, the stock's prior six-month compound rate of return; *IBESLTGs*, the IBES consensus forecast for long-term growth; and *DP* the dividend yield, accumulated regular dividends per share over the last twelve months divided by current price per share.

Growth in:	*PASTGS5*	*EP*	*G*	*RDSALES*	*TECH*	*BM*	*PASTR6*	*IBESLTG*	*DP*	R^2
					(A) Growth Rate in Year t+1					
SALES	0.0890	0.1641	0.0141	0.0979	−0.0038	−0.0184	0.0365	0.3018	−0.5258	0.0709
	(3.7)	(6.0)	(1.5)	(1.6)	(−0.5)	(−4.7)	(3.0)	(6.1)	(−4.8)	
OIBD	−0.0729	−0.2400	0.0064	0.2047	−0.0045	0.0031	−0.0592	0.2334	−0.5390	0.0274
	(−1.3)	(−3.3)	(0.9)	(1.0)	(−0.3)	(0.4)	(−2.4)	(2.6)	(−3.9)	
OBEI	−0.0971	−0.3982	−0.0242	−0.0024	−0.0162	0.0093	−0.0621	0.1179	−0.9564	0.0263
	(−1.4)	(−3.3)	(−1.5)	(−0.0)	(−0.7)	(0.4)	(−2.0)	(0.9)	(−3.5)	
					(B) Annualized Growth Rate over Years t+1 to t+3					
SALES	0.0469	0.1400	0.0099	0.0974	0.0014	−0.0253	0.0311	0.1901	−0.5758	0.0984
	(1.3)	(5.4)	(1.6)	(3.1)	(0.6)	(−9.2)	(6.8)	(9.3)	(−6.4)	
OIBD	−0.0547	−0.0554	0.0014	0.3453	−0.0127	−0.0073	−0.0089	0.1147	−0.4060	0.0296
	(−1.5)	(−1.8)	(0.1)	(3.1)	(−3.2)	(−1.1)	(−1.7)	(2.0)	(−2.6)	
IBEI	0.0087	−0.1881	0.0011	0.3436	−0.0191	−0.0061	−0.0279	0.0758	−0.0630	0.0257
	(0.5)	(−6.0)	(0.1)	(2.4)	(−2.9)	(−0.4)	(−6.5)	(0.9)	(−0.3)	

Table X—*continued*

				(C) Annualized Growth Rate over Years t+1 to t+5						
SALES	0.0252	0.1074	0.0067	0.0931	0.0014	−0.0260	0.0227	0.1538	−0.5446	0.1175
	(0.7)	(10.5)	(3.6)	(6.8)	(0.4)	(−7.4)	(3.2)	(3.1)	(−16.6)	
OIBD	−0.0645	−0.0146	−0.0035	0.3476	−0.0115	−0.0069	−0.0133	0.1227	−0.2675	0.0367
	(−3.0)	(−0.6)	(−0.5)	(7.6)	(−10.3)	(−1.8)	(−2.3)	(1.5)	(−7.4)	
IBEI	−0.0163	−0.1222	−0.0098	0.2493	−0.0133	−0.0095	−0.0293	0.0729	−0.0917	0.0313
	(−4.2)	(−2.3)	(−0.6)	(3.7)	(−3.0)	(−1.0)	(−2.8)	(0.9)	(−0.7)	
SALES	0.1128	0.0351	0.0628	0.2554						0.0507
	(2.7)	(1.8)	(2.3)	(4.3)						
OIBD	−0.0080	−0.0518	−0.0166	0.3779						0.0150
	(−0.2)	(−3.3)	(−0.7)	(13.1)						
IBEI	0.0311	−0.1295	−0.0675	0.2229						0.0148
	(25.5)	(−3.8)	(−1.5)	(2.4)						
				(D) Annualized Growth Rate over Years t+2 to t+5						
SALES	0.0175	0.0983	0.0060	0.1020	0.0007	−0.0273	0.0218	0.1237	−0.5122	0.0902
	(0.5)	(5.0)	(2.9)	(5.6)	(0.2)	(−6.3)	(3.7)	(2.8)	(−20.1)	
OIBD	−0.0665	0.0136	−0.0147	0.3856	−0.0130	−0.0049	−0.0042	0.1354	−0.3197	0.0335
	(−2.1)	(1.0)	(−1.1)	(4.9)	(−7.7)	(−0.9)	(−0.3)	(1.7)	(−2.7)	
IBEI	0.0119	−0.0932	0.0018	0.2897	−0.0174	−0.0075	−0.0245	0.0809	−0.0538	0.0268
	(0.6)	(−2.6)	(0.1)	(12.8)	(−5.8)	(−0.6)	(−1.8)	(1.0)	(−0.4)	
SALES	0.0962	0.0279	0.0655	0.2515						0.0398
	(2.1)	(1.6)	(3.1)	(5.2)						
OIBD	−0.0097	−0.0255	−0.0023	0.3840						0.0144
	(−0.2)	(−1.2)	(−0.1)	(8.6)						
IBEI	0.0534	−0.1065	−0.0448	0.2310						0.0144
	(3.2)	(−3.3)	(−0.8)	(5.5)						

Growth in each operating peformance variable is measured on a per share basis as of the sample formation date, with the number of shares outstanding adjusted to reflect stock splits and dividends. Values of *PASTGS5, RDSALES, EP, G,* and *PASTR6* are Winsorized at their 5th and 95th percentiles; *IBESLTG* is Winsorized at its 1st and 99th percentiles; and *DP* is Winsorized at its 98th percentile. Stocks with negative values of *BM* are excluded. In the regressions for *OIBD* or *IBEI,* firms with negative values of the operating performance variable in the base year are excluded, as are stocks with ratios of price to the operating performance variable above 100. The reported statistics are the averages over all years of the estimated coefficients, with t-statistics in parentheses, as well as the average R^2 of the model. In panels B to D, standard errors are based on the Hansen-Hodrick (1980) adjustment for serial correlation.

To see whether high past growth is a precursor to future growth, we use *PASTGS5*, the growth rate in sales over the five years prior to the sample selection date. Sales growth is correlated with earnings growth, but is much less erratic and so should yield a relatively more reliable verdict on whether past growth helps to predict future growth.[14]

Simple theoretical models of earnings growth suggest one set of variables that, in principle, should help to predict growth. For instance, a firm's earnings-to-price ratio, *EP*, is widely interpreted as impounding the market's expectations of future growth. We measure this as the firm's income before extraordinary items in the year prior to the sample selection date, relative to its price at the sample selection date. Similarly, in the standard constant-growth valuation model, a firm's sustainable growth rate is given by the product of its return on equity and its plowback ratio. Our proxy for this measure is *G*, where return on equity is measured as the firm's earnings before extraordinary items in the year prior to sample selection, divided by book equity in the preceding year; plowback is one minus the ratio in the prior year of dividends to income before extraordinary items.[15] Finally, to capture the firm's investment opportunities, we use the ratio of research and development expenditures to sales, *RDSALES*. The intensity of R&D relative to sales is widely used in practice as an indicator of how much resources a firm is investing in future growth opportunities (see, e.g., Chan et al. (2001)). When a firm has no R&D spending, we set this variable to zero, so all firms are eligible for the regression.

The forecast equation also incorporates variables that are popularly thought to connote high growth. Firms in technologically innovative industries, or more generally, growth stocks as measured by low book-to-market ratios, are popularly associated with high growth. High past returns for a stock may signal upward revisions in investors' expectations of future growth. Analysts' long-term forecasts are another proxy for the market's expectations of future growth. Finally, the dividend yield may provide information on the firm's investment opportunities and hence ability to grow future earnings. Correspondingly, the other forecasting variables are *TECH*, a dummy variable with a value of one for a stock in the pharmaceutical and technology sectors (defined as in Panel A of Table IV) and zero otherwise; *BM*, the firm's book-to-market value of equity; *PASTR6*, the stock's prior six-month compound rate of return; *IBESLTG*, the *IBES* consensus forecast of long-term growth; and *DP*, the ratio of dividends per share cumulated over the previous 12 months to current price. To be eligible for inclusion in the regression at a given horizon, a firm must have nonmissing values for all the predictors. In addition it must have a positive base-year value for the operating performance indicator in question, so as to calculate a growth rate. To screen out

[14] Results using past five-year growth in *OIBD* or *IBEI* as predictor variables indicate that these variables do a worse job in capturing any persistence in growth.

[15] Firms with negative value of book equity are dropped from the sample for the regression. In cases where the measure for sustainable growth is negative (when income is negative, or when dividends to common exceed income so the plowback ratio is negative), we set the sustainable growth rate variable *G* to zero.

outliers due to low values in the base year, we exclude cases where the ratio of the price to the operating performance variable exceeds 100 in the base year.

The model is estimated each year-end, yielding a time series of estimated coefficients and the adjusted R^2. Means for the time series, and t-statistics based on the standard error from the time series, are reported in Table X. Standard errors from the overlapping regressions in Panels B to D use the Hansen–Hodrick (1980) correction for serial correlation.

The results in Table X deliver a clear verdict on the amount of predictability in growth rates. In line with our earlier results, it is much easier to forecast growth in sales than growth in variables such as *OIBD* and *IBEI*, which focus more on the bottom line. For example, the forecasting model that has the highest adjusted R^2 in Table X is the equation for five-year growth in sales (11.75 percent; Panel C). By comparison, the adjusted R^2 in the equations for *OIBD* and *IBEI* barely exceed 3 percent, so there is relatively little predictability for growth in these variables. If anything, our results may be overstating the predictability in growth. Our cross-sectional regressions are reestimated monthly, so we let the coefficients in the model change over time. As a check on the robustness of our results, we also replicated the regressions in the table using growth rate ranks (ranging from zero for the firm with the lowest growth rate in that year to one for the firm with the highest growth rate). The results from the growth rank regressions echo the findings in Table X.

Our full model includes a total of nine predictors, and the correlations between some of them are quite high. As a result, sorting out the relative importance of each variable is not straightforward. Focusing on the models for *OIBD* and *IBEI*, no variable has coefficients that are statistically significant across all forecasting horizons. The coefficient of past sales growth *PASTGS5* is generally negative, suggesting that there are reversals in growth rates. When past sales have been declining, income levels tend to be low in the base year, resulting in relatively higher future growth rates.[16]

At least over longer horizons (Panels B to D), R&D intensity, *RDSALES*, has the strongest forecast power. In accordance with economic intuition, firms that are investing heavily in R&D, and thereby building up their intangible capital base, on average tend to be associated with elevated future growth. Specifically, a firm that spends 10 percent of its sales on R&D tends to have higher five-year growth in *IBEI* by about 2.5 percent, compared to a firm with no R&D (Panel C). However, the high correlation between *RDSALES* and variables like *TECH* or *DP* suggests caution is warranted in interpreting this result.

The variable *IBESLTG* is provided by supposed experts, and is widely used as a proxy for expected future growth. Its coefficient has the expected positive sign, but it is not statistically significant in the equations for *IBEI*. This variable does somewhat better in the equations for *OIBD*, especially over shorter horizons. In general, however, *IBESLTG* does not have higher forecast power than the divi-

[16] The effect of extremely low base-year values is mitigated to some extent because we drop from the regression cases where the ratio of the price to operating performance indicator exceeds 100 in the base year. However, this is only a partial solution.

dend yield, *DP*, which can be viewed as another proxy for the firm's investment opportunities.[17] In terms of predicting long-term growth, the forecasts of highly paid security analysts are about as helpful as the dividend yield, a piece of information that is readily available in the stock listings of most newspapers.

In line with the results in Table VIII, a low earnings yield *EP* is associated with higher future growth rates, especially for *IBEI*. However, the association is driven by a relatively small number of cases with unusually low base-year earnings. Low values of the earnings base result in a low earnings yield, and given that the firm survives, in an unusually high future growth rate. This explanation agrees with the results in Table VIII, where the relation between *EP* and future growth is confined to companies with the highest growth rates. As further confirmation of this line of reasoning, when we use growth in a variable such as *OIBD*, which is less prone to the problem of a low base level, *EP* does a poor job of forecasting in Table X.

The coefficient of the technology dummy *TECH* is highly significant in many cases, but it generally has an unexpected sign. This may be due to the high correlation between *TECH* and *RDSALES*. For example, dropping *RDSALES* from the model substantially reduces the t-statistics for *TECH* (although its coefficient retains a negative sign).

Neither the book-to-market ratio nor our proxy for sustainable growth G reliably predicts growth in *OIBD* and *IBEI*. Contrary to the conventional notion that high past returns signal high future growth, the coefficient of *PASTR6* is negative. The explanation for this result echoes our explanation for our findings with respect to *EP*. When a firm's near-term prospects sour and current earnings are poor, stock returns tend to be disappointing as well. Once again, these cases of low base levels of earnings may induce a negative association between past return and future growth.

Panels C and D also provide results that are based on a simple textbook model for predicting growth. Here the predictor variables are earnings yield, sustainable growth, and R&D intensity. The textbook model has weak forecast power. For example, over a five-year horizon, the adjusted R^2 from the equation for *IBEI* is only 1.48 percent.

VIII. Summary and Conclusions

We analyze historical long-term growth rates across a broad cross section of stocks using a variety of indicators of operating performance. All the indicators yield a median growth rate of about 10 percent per year (with dividends reinvested) over the 1951 to 1998 period. With dividends taken out, the median estimate is the same magnitude as the growth rate of gross domestic product over this period, between 3 and 3.5 percent in real terms. Given the survivorship bias underlying the growth rate calculations, the expected growth rate is likely to be lower. Based on these historical values and the low level of the current dividend

[17] Forecasting models with *IBESLTG* and DP as the only predictors yield qualitatively similar conclusions. In particular, the dividend yield does at least as well as the consensus forecast in forecasting growth.

yield, looking forward, the expected return on stocks in general does not appear to be high. In particular, the expected return using a constant-growth dividend valuation model is about 7.5 percent, assuming there is no mispricing.

Expectations about long-term growth are also crucial inputs in the valuation of individual stocks and for estimating firms' cost of capital. At year-end 1999, a sizeable portion of the market commanded price–earnings multiples in excess of 100. Justifying such a multiple under some relatively generous assumptions requires that earnings grow at a rate of about 29 percent per year for 10 years or more. Historically, some firms have achieved such dazzling growth. These instances are quite rare, however. Going by the historical record, only about 5 percent of surviving firms do better than a growth rate of 29 percent per year over 10 years. In the case of large firms, even fewer cases (less than 1 percent) would meet this cutoff. On this basis, historical patterns raise strong doubts about the sustainability of such valuations.

Nonetheless, market valuation ratios reflect a pervasive belief among market participants that firms who can consistently achieve high earnings growth over many years are identifiable ex ante. The long-term growth expectations of one influential segment of the market, security analysts, boldly distinguish between firms with strong and weak growth prospects. To see whether this belief that many firms can achieve persistently high growth holds up in reality, we use an experimental design that singles out cases where a firm consistently delivers favorable growth for several years in a row. Our results suggest that there is some persistence in sales revenue growth. The persistence in sales does not translate into persistence of earnings, however. Even though we measure consistency against a hurdle that is not particularly challenging (the median growth rate), there are few traces of persistence in growth of operating income before depreciation, or in income before extraordinary items. For example, on average three percent of the available firms manage to have streaks in growth above the median for five years in a row. This matches what is expected by chance. The evidence for persistence is still slim under more relaxed criteria for consistency in growth. All in all, the evidence suggests that the odds of an investor successfully uncovering the next stellar growth stock are about the same as correctly calling coin tosses.

A skeptic might argue that while there is little persistence for the population at large, specific segments of the market are able to improve earnings steadily over long periods. In particular, popular sentiment views firms in the pharmaceutical and technology sectors, along with glamour stocks, as being able to maintain consistently high growth rates. To accommodate this argument, we narrow our search to these subsets of firms. While there is persistence in sales growth, when it comes to growth in bottom-line income, over long horizons, the likelihood of achieving streaks is not much different from sheer luck. Conversely, value firms who are out of favor do not seem to do much worse, although survivorship bias makes it difficult to deliver a definitive verdict. To narrow the search even more, we check whether firms with consistently high past growth manage to maintain their performance going forward. While past growth carries over to future sales growth, the income variables do not display strong persistence.

There is a widespread belief that earnings-to-price ratios signal future growth rates. However, the cross-sectional relation between earnings yields and future growth is weak, except possibly in the cases of firms ranked highest by realized growth. For these firms, an inverse association between ex ante earnings yields and growth may arise because they start from a battered level of earnings in the base year, so future growth is high. In light of the noisiness of the earnings yield measure, academic and practitioner research mainly focuses on other valuation ratios such as book-to-market and sales-to-price. These multiples, which are better behaved, show little evidence of anticipating future growth. On the other hand, firms that enjoy a period of above-average growth are subsequently rewarded by investors with relatively high ratios of sales-to-price and book-to-market. Conversely, investors tend to penalize firms that have experienced poor growth. These results are consistent with the extrapolation hypothesis of La Porta (1996) and La Porta et al. (1997).

Additionally, it is commonly suggested that one group of informed participants, security analysts, may have some ability to predict growth. The dispersion in analysts' forecasts indicates their willingness to distinguish boldly between high- and low-growth prospects. IBES long-term growth estimates are associated with realized growth in the immediate short-term future. Over long horizons, however, there is little forecastability in earnings, and analysts' estimates tend to be overly optimistic. The spread in predicted growth between the top and bottom quintiles by IBES forecasts is 16.4 percent, but the dispersion in realized five-year growth rates is only 7.5 percent. On the basis of earnings growth for portfolios formed from stocks sorted by IBES forecasts, the spread in realized five-year growth rates is even smaller (3.3 percent). In any event, analysts' forecasts do not do much better than a naive model that predicts a one-for-one tradeoff between current dividend yield and future growth per share.

A regression forecasting model which brings to bear a battery of predictor variables confirms that there is some predictability in sales growth, but meager predictability in long-term growth of earnings. Only about three percent of the variation in five-year earnings growth rates is captured by the model. One variable that stands out is the level of research and development intensity, suggesting that a firm's intangible assets may have an important influence on its future performance. On the whole, the absence of predictability in growth fits in with the economic intuition that competitive pressures ultimately work to correct excessively high or excessively low profitability growth.

REFERENCES

Asness, Clifford, 2000, Bubble logic, Working paper, AQR Capital Management.

Bakshi, Gurdip, and Zhiwu Chen, 1998, Stock valuation in dynamic economies, Working paper, University of Maryland.

Ball, Ray, and Ross Watts, 1972, Some time-series properties of accounting income, *Journal of Finance* 27, 663–682.

Beaver, William H., 1970, The time series behavior of earnings, *Journal of Accounting Research* 8 (Suppl.), 62–99.

Beaver, William H., and Dale Morse, 1978, What determines price-earnings ratios?, *Financial Analysts Journal* 34, 65–76.

Brealey, Richard A., 1983, *An Introduction to Risk and Return from Common Stocks* (2nd edition) (MIT Press, Cambridge, MA).

Camerer, Colin, 1989, Does the basketball market believe in the "hot hand"? *American Economic Review* 79, 1257–1261.

Chan, Louis K. C., Narasimhan Jegadeesh, and Josef Lakonishok, 1995, Evaluating the performance of value versus glamour stocks: The impact of selection bias, *Journal of Financial Economics* 38, 269–296.

Chan, Louis K. C., Jason Karceski, and Josef Lakonishok, 2000, New paradigm or same old hype in equity investing? *Financial Analysts Journal* 56, 23–36.

Chan, Louis K. C., Josef Lakonishok, and Theodore Sougiannis, 2001, The stock market valuation of research and development expenditures, *Journal of Finance* 56, 2431–2456.

Claus, James, and Jacob Thomas, 2001, Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stocks, *Journal of Finance* 56, 1629–1666.

Daniel, Kent, and Sheridan Titman, 2001, Market reactions to tangible and intangible information, Working paper, Kellogg School of Management, Northwestern University.

Fama, Eugene F., and Kenneth R. French, 1992, The cross section of expected stock returns, *Journal of Finance* 47, 427–465.

Fama, Eugene F., and Kenneth R. French, 1995, Size and book-to-market factors in earnings and returns, *Journal of Finance* 50, 131–155.

Fama, Eugene, F., and Kenneth R. French, 1997, Industry costs of equity, *Journal of Financial Economics* 43, 153–193.

Fama, Eugene F., and Kenneth R. French, 2000, Forecasting profitability and earnings, *Journal of Business* 73, 161–175.

Fama, Eugene F., and Kenneth R. French, 2002, The equity premium, *Journal of Finance* 57, 637–659.

Fisher, Kenneth L., and Meir Statman, 2000, Cognitive biases in market forecasts, *Journal of Portfolio Management* 27, 72–81.

Gebhardt, William R., Charles M. C. Lee, and Bhaskaran Swaminathan, 2001, Toward an implied cost of capital, *Journal of Accounting Research* 39, 135–176.

Hansen, Lars, and Robert Hodrick, 1980, Forward exchange rates as optimal predictors of future spot rates: An econometric analysis, *Journal of Political Economy* 88, 829–853.

Hendricks, Darryll, Jayendu Patel, and Richard Zeckhauser, 1993, Hot hands in mutual funds: Short-run persistence of relative performance, 1974–1988, *Journal of Finance* 48, 93–130.

Kahneman, Daniel, and Mark W. Riepe, 1998, Aspects of investor psychology, *Journal of Portfolio Management* 24, 52–65.

La Porta, Rafael, 1996, Expectations and the cross section of stock returns, *Journal of Finance* 51, 1715–1742.

La Porta, Rafael, Josef Lakonishok, Andrei Shleifer, and Robert Vishny, 1997, Good news for value stocks: Further evidence on market efficiency, *Journal of Finance* 52, 859–874.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1994, Contrarian investment, extrapolation, and risk, *Journal of Finance* 49, 1541–1578.

Lee, Charles M. C., James Myers, and Bhaskaran Swaminathan, 1999, What is the intrinsic value of the Dow? *Journal of Finance* 54, 1693–1741.

Lintner, John, and Robert Glauber, 1967, Higgledy piggledy growth in America, reprinted in James Lorie and Richard Brealey, eds., *Modern Developments in Investment Management* (Dryden Press, Hinsdale, IL).

Little, I. M. D., 1962, Higgledy piggledy growth, *Bulletin of the Oxford University Institute of Economics and Statistics* 4, 387–412.

Little, I. M. D., and Arthur C. Rayner, 1966, *Higgledy Piggledy Growth Again* (Basil Blackwell, Oxford).

Mezrich, Joseph, Qi Zeng, David Nordquist, and Lakshmi Seshadri, 2001, Rebroadcast: Changing of the guard, *Equity Research Quantitative Strategy* (Morgan Stanley, New York, NY).

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management* 26, 10–17.

Welch, Ivo, 2000, Views of financial economists on the equity premium and on professional controversies, *Journal of Business* 73, 501–537.

INTEREST RATES AND COST OF CAPITAL RELATIONSHIPS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
											30-Year Spread				
					Qtrly Electric ROE	Electric Risk Premium	Qtrly Gas ROE	Gas Risk Premium	30-Year T-Bonds	10-Year T-Bonds	Utility Bond Rate - Government Rate				10-Year Sprd Avg Utility - Gov Rate
Monthly Rates	Double-A	Single-A	Triple-B	Util Avg							Double-A	Single-A	Triple-B	Util Avg	
Jan-01	7.73	7.80	7.99	7.76					5.54	5.16	2.19	2.26	2.45	2.22	2.60
Feb-01	7.62	7.74	7.94	7.69					5.45	5.10	2.17	2.29	2.49	2.24	2.59
Mar-01	7.51	7.68	7.86	7.59	11.38	3.70	11.16	3.48	5.34	4.89	2.17	2.34	2.51	2.25	2.70
Apr-01	7.72	7.94	8.06	7.81					5.65	5.14	2.07	2.29	2.41	2.16	2.67
May-01	7.79	7.99	8.11	7.86					5.78	5.39	2.01	2.21	2.33	2.10	2.49
Jun-01	7.62	7.85	8.02	7.75	10.88	3.07	10.75	2.94	5.67	5.28	1.95	2.18	2.35	2.08	2.47
Jul-01	7.55	7.78	8.05	7.71					5.61	5.24	1.94	2.17	2.44	2.10	2.47
Aug-01	7.39	7.59	7.95	7.57					5.48	4.97	1.91	2.11	2.47	2.09	2.60
Sep-01	7.55	7.75	8.12	7.73	10.78	3.11	n/a	n/a	5.48	4.73	2.07	2.27	2.64	2.25	3.00
Oct-01	7.47	7.63	8.02	7.64					5.32	4.57	2.15	2.31	2.70	2.32	3.07
Nov-01	7.45	7.57	7.96	7.61					5.12	4.65	2.33	2.45	2.84	2.49	2.96
Dec-01	7.53	7.83	8.27	7.86	11.50	3.80	10.65	2.95	5.48	5.09	2.05	2.35	2.79	2.38	2.77
2001 Annual	7.58	7.76	8.03	7.72	11.09	3.37	10.95	3.23	5.49	5.02	2.08	2.27	2.54	2.22	2.70
											Long-term** Spread				
					Qtrly Electric ROE	Electric Risk Premium	Qtrly Gas ROE	Gas Risk Premium	LT** T-Bonds	10-Year T-Bonds	Utility Bond Rate - Government Rate				10-Year Sprd Avg Utility - Gov Rate
Monthly Rates	Double-A	Single-A	Triple-B	Util Avg							Double-A	Single-A	Triple-B	Util Avg	
Jan-02	7.28	7.66	8.13	7.69					5.45	5.04	1.83	2.21	2.68	2.24	2.65
Feb-02	7.14	7.54	8.18	7.62					5.58	4.91	1.58	1.98	2.62	2.06	2.71
Mar-02	7.42	7.76	8.32	7.83	10.87	3.16	10.67	2.96	5.88	5.28	1.54	1.88	2.44	1.95	2.55
Apr-02	7.38	7.57	8.26	7.74					5.82	5.21	1.56	1.75	2.44	1.92	2.53
May-02	7.43	7.52	8.33	7.76					5.79	5.16	1.64	1.73	2.54	1.97	2.60
Jun-02	7.33	7.42	8.26	7.67	11.41	3.69	11.64	3.92	5.66	4.93	1.67	1.76	2.60	2.01	2.74
Jul-02	7.22	7.31	8.07	7.54					5.54	4.65	1.68	1.77	2.53	2.00	2.89
Aug-02	7.10	7.17	7.74	7.34					5.23	4.26	1.87	1.94	2.51	2.11	3.08
Sep-02	6.98	7.08	7.62	7.23	11.06	3.69	11.50	4.13	4.90	3.87	2.08	2.18	2.72	2.33	3.36
Oct-02	7.07	7.23	8.00	7.43					5.07	3.94	2.00	2.16	2.93	2.36	3.49
Nov-02	7.03	7.14	7.76	7.31					5.10	4.05	1.93	2.04	2.66	2.21	3.26
Dec-02	6.94	7.07	7.61	7.20	11.20	3.89	10.78	3.47	5.06	4.03	1.88	2.01	2.55	2.14	3.17
2002 Annual	7.19	7.37	8.02	7.53	11.16	3.63	11.03	3.50	5.42	4.61	1.77	1.95	2.60	2.11	2.92
											Long-term** Spread				
					Qtrly Electric ROE	Electric Risk Premium	Qtrly Gas ROE	Gas Risk Premium	LT** T-Bonds	10-Year T-Bonds	Utility Bond Rate - Government Rate				10-Year Sprd Avg Utility - Gov Rate
Monthly Rates	Double-A	Single-A	Triple-B	Util Avg							Double-A	Single-A	Triple-B	Util Avg	
Jan-03	6.87	7.07	7.47	7.13					5.07	4.05	1.80	2.00	2.40	2.06	3.08
Feb-03	6.66	6.93	7.17	6.92					4.93	3.90	1.73	2.00	2.24	1.99	3.02
Mar-03	6.56	6.79	7.05	6.80	11.47	4.52	11.38	4.43	4.90	3.81	1.66	1.89	2.15	1.90	2.99
Apr-03	6.47	6.64	6.94	6.68					4.99	3.96	1.48	1.65	1.95	1.69	2.72
May-03	6.20	6.36	6.47	6.35					4.61	3.57	1.59	1.75	1.86	1.74	2.78
Jun-03	6.12	6.21	6.30	6.21	11.16	4.75	11.36	4.95	4.45	3.33	1.67	1.76	1.85	1.76	2.88
Jul-03	6.37	6.57	6.67	6.54					5.00	3.98	1.37	1.57	1.67	1.54	2.56
Aug-03	6.48	6.76	7.08	6.78					5.41	4.45	1.07	1.37	1.67	1.37	2.33
Sep-03	6.30	6.56	6.87	6.58	9.95	3.32	10.61	3.98	5.23	4.27	1.07	1.33	1.64	1.35	2.31
Oct-03	6.28	6.43	6.79	6.50					5.24	4.29	1.04	1.19	1.55	1.26	2.21
Nov-03	6.26	6.37	6.69	6.44					5.20	4.30	1.06	1.17	1.49	1.24	2.14
Dec-03	6.18	6.27	6.61	6.36	11.09	4.66	10.84	4.41	5.15	4.27	1.03	1.12	1.46	1.21	2.09
2003 Annual	6.40	6.58	6.84	6.61	10.97	4.36	10.99	4.38	5.02	4.02	1.38	1.57	1.83	1.59	2.59
											Long-term** Spread				
					Qtrly Electric ROE	Electric Risk Premium	Qtrly Gas ROE	Gas Risk Premium	LT** T-Bonds	10-Year T-Bonds	Utility Bond Rate - Government Rate				10-Year Sprd Avg Utility - Gov Rate
Monthly Rates	Double-A	Single-A	Triple-B	Util Avg							Double-A	Single-A	Triple-B	Util Avg	
Jan-04	6.06	6.15	6.47	6.23					5.05	4.15	1.01	1.10	1.42	1.18	2.06
Feb-04	6.10	6.15	6.28	6.17					4.99	4.08	1.11	1.16	1.29	1.18	2.09
Mar-04	5.93	5.97	6.12	6.01	11.00	4.86	11.10	4.96	4.79	3.83	1.14	1.18	1.33	1.22	2.18
Apr-04	6.33	6.35	6.46	6.38					5.20	4.35	1.13	1.15	1.26	1.18	2.03
May-04	6.66	6.62	6.75	6.68					5.48	4.72	1.18	1.14	1.27	1.20	1.96
Jun-04	6.30	6.46	6.84	6.53	10.50	3.97	10.25	3.72	5.45	4.73	0.85	1.01	1.39	1.08	1.80
Jul-04	6.09	6.27	6.67	6.34					5.24	4.50	0.85	1.03	1.43	1.10	1.84
Aug-04	5.95	6.14	6.45	6.18					5.07	4.28	0.88	1.07	1.38	1.11	1.90
Sep-04	5.79	5.98	6.27	6.01	10.33	4.15	10.37	4.19	4.89	4.13	0.90	1.09	1.38	1.12	1.88
Oct-04	5.74	5.94	6.17	5.95					4.85	4.10	0.89	1.09	1.32	1.10	1.85
Nov-04	5.79	5.97	6.16	5.97					4.89	4.19	0.90	1.08	1.27	1.08	1.78
Dec-04	5.78	5.92	6.10	5.93	10.91	4.98	10.66	4.71	4.88	4.23	0.90	1.04	1.22	1.05	1.70
2004 Annual	6.04	6.16	6.40	6.20	10.73	4.53	10.59	4.39	5.07	4.27	0.98	1.10	1.33	1.13	1.92
															1.78
											Long-term** Spread				
					Qtrly Electric ROE	Electric Risk Premium	Qtrly Gas ROE	Gas Risk Premium	LT** T-Bonds	10-Year T-Bonds	Utility Bond Rate - Government Rate				10-Year Sprd Avg Utility - Gov Rate
Monthly Rates	Double-A	Single-A	Triple-B	Util Avg							Double-A	Single-A	Triple-B	Util Avg	
Jan-05	5.68	5.78	5.95	5.80					4.77	4.22	0.91	1.01	1.18	1.03	1.58
Feb-05	5.55	5.61	5.76	5.64					4.61	4.17	0.94	1.00	1.15	1.03	1.47
Mar-05	5.76	5.83	6.01	5.86	10.44	4.67	10.65	4.88	4.89	4.50	0.87	0.94	1.12	0.97	1.38
Apr-05	5.56	5.64	5.95	5.72					4.75	4.34	0.81	0.89	1.20	0.97	1.38
May-05	5.39	5.53	5.88	5.60					4.56	4.14	0.83	0.97	1.32	1.04	1.46
Jun-05	4.99	5.35	5.63	5.32	10.28	4.73	10.53	4.98	4.35	4.00	0.64	1.00	1.28	0.97	1.32
Jul-05															
Aug-05															
Sep-05															
Oct-05															
Nov-05															
Dec-05															
2005 Annual	5.49	5.62	5.86	5.66	10.36	4.70	10.56	4.93	4.66	4.23	0.83	0.97	1.21	1.00	1.43
Last 3-mo Avg	5.31	5.51	5.82	5.55					4.55	4.16	0.76	0.95	1.27	0.99	1.39

**Yields for all Treasury bonds with remaining terms to maturity of 25 years and over beginning 2/2002, 20-year bonds beginning 6/2004.
Sources: Moodys (Mergent) Bond Record (Corporate Bond Yield Averages), Federal Reserve Syestem website (Government Rates), Regulatory Research Associates, Major Rate Case Decisions (Allowed ROEs).

Explanatory Note:
Equity Risk Premim (Column 7) = Column 6 minus Column 5.
Quarterly observations may not be statistically significant, because for the period since 1999, typically there have been only a few cases per quarter.