STRATEGY AND INTEGRATED FINANCIAL RATIO PERFORMANCE MEASURES: FURTHER EVIDENCE OF THE FINANCIAL PERFORMANCE SCORECARD AND HIGH-PERFORMANCE COMPANIES

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ABSTRACT

This study continues our exploration of the links between strategy, execution, and financial performance. Most recently, we investigated empirically U.S. companies in the S&P 500 and companies that have displayed specific characteristics of high-performance companies (HPCs): sustained and superior cash flow returns, asset growth, and total shareholder returns.

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In this new study, we empirically investigate HPC and integrated financial ratio analysis based on the following components: (1) replication of previous study with certain modifications, (2) sustainability of performance in HPCs, (3) operating asset management characteristics, especially as they relate to the cash cycle, and (4) anomalies identified in the measures of cash flow yield.

INTRODUCTION

This study continues our exploration of the links between strategy, execution, and financial performance. Our prior research (Frigo, Needles, & Powers, 2002; Needles, Frigo, & Powers, 2002, 2004) examined these links by emphasizing the underlying performance drivers that describe how a company executes strategy to create financial value. Most recently, we investigated empirically U.S. companies in the S&P 500 and companies that have displayed specific characteristics of high-performance companies (HPCs): sustained and superior cash flow returns, asset growth, and total shareholder returns. In the prior study, we found support for the hypothesized relationships between integrated financial ratio performance measures as represented by the Financial Performance Scorecard™ (FPS) and also of above-mean performance by HPCs across all performance measures when compared with the companies in the S&P 500 (Needles et al., 2004).

In this new study, we empirically investigate HPCs and integrated financial ratio analysis based on the following components: (1) replication of previous study with certain modifications, (2) sustainability of performance in HPCs, (3) operating asset management characteristics, especially as they relate to the cash cycle, and (4) anomalies identified in the measures of cash flow yield.

PREVIOUS RESEARCH

As noted, the new research extends previous research, which investigated the relationship between strategy and financial ratio analysis (Frigo et al., 2002; Needles et al., 2004). Further, it is related to previous research by, among others, Nissim and Penman (1999, 2001). We also referenced Brief and Lawson (1992), Fairfield and Yohn (1999), Feltham and Olsson

(1995), Fera (1997), Jansen and Yohn (2002), Lev and Thiagarajan (1993), Ohlson (1995), Penman (1991), Piotroski (2000), and Selling and Stickney (1989).

Frigo and Litman (2002) and Frigo (2002) have emphasized a "Return Driven Strategy" under which business activities are ethically aligned with achieving maximum financial performance and shareholder wealth. Financial statements provide important information about a company's ability to achieve the strategic objective of creating value for its owners. The intelligent user of financial statements will be able to discern how well the company has performed in achieving this objective. Financial analysis provides the techniques to assist the user in this task. In short, the financial statements reflect how well a company's management has carried out the strategic and operating plans of the business. The marketplace, in turn, evaluates this performance, and a value is placed on the company.

Analysts have traditionally conducted ratio analysis by examining ratios related to various aspects of a business's operations. Our previous research (Needles et al., 2004) has shown empirically how ratios interact in integrated financial ratio analysis, which we call the FPS, to show whether a company is creating or destroying value. The FPS is a structure or framework for considering the interaction of financial ratios, with particular emphasis on the drivers of performance and their relationship to performance measures. These performance measures are reflected ultimately in a return that is compared with a benchmark cost of capital. If the return exceeds cost of capital, value has been created. If the return is less than cost of capital, value has been destroyed. The "spread" between return on investment and the cost of capital was used as a criterion for selecting the leading companies; however, for purposes of evaluating the FPS in this study, we will assume that the cost of capital is determinable and given (Adman & Haight, 2002; Gebhardt, Lee, & Swaminathan, 2001).

The FPS is based on the premise that management must achieve certain financial objectives in order to create value and that these financial objectives are interrelated. Further, underlying the performance measures that analysts and the financial press commonly use to assess a company's financial performance are certain financial ratios, called performance drivers, that are critical to achieving the performance measures. We found that while HPCs uniformly excel on the basis of performance measures, they will not display uniform characteristics when it comes to performance drivers, because these measures are more a function of the various strategies that the companies may employ to achieve high performance (Needles et al., 2004).

Profitability and liquidity are traditionally the two most prominent financial objectives. An expanded view of these objectives includes the following (Needles et al., 2004):

Financial Objectives	Links to Financial Performance
Total asset management	Ability to utilize all the assets of a company in a way that maximizes revenue while minimizing investment
Profitability	Ability to earn a satisfactory net income
Financial risk	Ability to use debt effectively without jeopardizing the future of the company
Liquidity	Ability to generate sufficient cash to pay bills when they're due and to meet unexpected needs for cash
Operating asset management	Ability to utilize current assets and liabilities to support growth in revenues with minimum investment

The components of the FPS are summarized as follows (Needles et al., 2004):

Financial Objective	Performance Drivers	Performance Measures
Total asset management	Asset turnover	Growth in revenues
Profitability	Profit margin	Return on assets
Financial risk	Debt to equity	Return on equity
Liquidity	Cash flow yield	Cash flow returns Free cash flows
Operating asset management	Turnover ratios	Cash cycle

The formulas for the ratios appear in Appendix A. Specifically, our previous research investigated (1) evidence with regard to the components of the FPS – in particular, the relationships between the performance drivers and the performance measures and (2) the relationships between the performance of the HPCs and that of their respective industries. Our analysis focused on two groups of companies: companies in the S&P 500 and "high-performance" companies as determined by Frigo in the Return Driven

Strategy Initiative (Frigo, 2003a, 2003b), according to the following three criteria during the period 1990–2000:

- Cash flow return on investment at twice or more the cost of capital (Madden, 1999).
- Growth rates in assets exceeding average gross domestic product growth.
- Relative total shareholder returns above the S&P 500 average.

Also included among the HPC group were 10 additional companies identified by Collins (2001), for a total of 48 companies that demonstrate superior performance in returns and growth over a sustained period. According to Return Driven Strategy (Frigo & Litman, 2002; Frigo, 2003a, 2003b; Litman & Frigo, 2004), the pathway to superior financial value creation is through the customer, by fulfilling unmet needs in increasing market segments.

The empirical results confirmed the basic propositions of the FPS and the criteria for choosing HPCs. These results are summarized as follows:

1. The performance drivers and performance measures are independent of each other, as shown by low correlation among each other or low-rank correlation. This proposition held true for all companies, for selected industries, and for industry leaders, all of which show independence among the ratios, with low correlations among performance drivers (except asset turnover and profit margin) and performance measures.
2. The criteria for choosing HPCs were validated by the performance measures in the FPS model. The HPCs exceed the industry averages across all performance measures and across all industries.
3. The HPCs show mixed results with regard to performance drivers when compared with industry drivers. HPCs excel on profit margin, are lower on cash flow yield, have lower financial risk, and have variable results for asset turnover. We believe these results are due in part to the different strategies that companies may employ.

The prior study had certain limitations that we address in this study. Specifically, we limited our ratio analysis in the prior study to the items from the database without adjustment. For instance, we did not adjust for negatives or outliers. If we were to adjust for these items, we believe we would achieve stronger results. We also need to explore more closely the effects of negatives on the ratios and their relationships, especially in the area of cash flow yield. Further, we did not study one component of the FPS: the operating asset objective, the related operating ratios, and the cash cycle. Finally, we felt the role and importance of the cash flow yield as a measure of financial performance needed further investigation.

EMPIRICAL OBJECTIVES

In this study, we continue our investigation of HPC and integrated financial ratio analysis by replicating our previous study with a modified sample and empirically investigating in HPC the following:

1. Sustainability of performance of HPCs.
2. Operating asset management characteristics, especially as they relate to the cash cycle.
3. Characteristics of cash flow yield.

EMPIRICAL SAMPLE

As it was in our prior study, the source of the data for this study was the CompuStat database. In the benchmark group, we included companies in the S&P 500 index for which data exist consecutively from 1996 to 2001. Based on this condition, data for 349 companies existed and were used in the prior study. For the present study, we made several changes in the benchmark group of S&P 500 companies:

- We excluded several industries whose financial structures typically depart from industrial, retail, and service businesses. These industries are utilities, insurance companies, financial institutions including banks and broker/dealers, hospitals, and educational services. This adjustment improved the comparability of the benchmark group with the HPCs.
- We expanded the number of companies to include those that were in the S&P 500 at any time during the period and for which data existed for the entire period (1997–2003). This adjustment lessened the variability of the benchmark group due to the previously smaller sample size.

After these screens, our sample expanded to 579 S&P companies.

We also made adjustments in the HPC group. In the prior study, as noted, the 48 companies in the group included 10 companies that were identified in the book *Good to Great* (Collins, 2001) but that did not appear in the Frigo screen. In the current study, we eliminated the 10 companies from the Collins study because they did not meet the criteria of the companies in the Frigo study. Thus, we were left with 38 companies identified by Frigo. These companies are listed in Appendix B.

In the analyses, companies were grouped by the first two digits of the standard industrial classification (SIC) code. Forty-eight industries were identified based on this grouping. For many industries, use of the first three

digits of the SIC code did not provide enough companies to derive reliable industry averages.

We provide test data for industries in which we had at least three HPCs, which were as follows (with two-digit SIC indicator):

- 28 Chemicals and allied products
- 35 Miscellaneous industrial, commercial, machinery and equipment (including computers)
- 38 Measuring and control devices
- 73 Business services

TEST PERIODS

Fig. 1 shows the period covered by each study, as well as the 10-year selection period, and the related price performance of the S&P 500. HPCs were selected based on their performance over the 10-year selection period of 1990–1999,

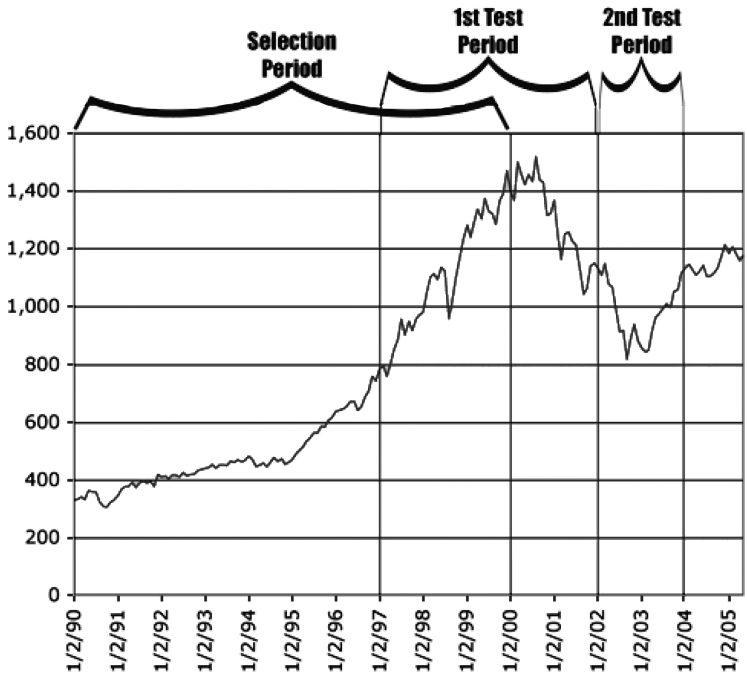

Fig. 1. Selection and Test Period with Market Price of S&P 500: 1990–2004.

according to the criteria listed previously. This period was characterized by generally higher prices and ended with the so-called bubble of the late 1990s. The first test period was the five-year period, 1997–2001. This period included the sharp run-up in the market to the peak of the bubble in 2000 and a steep decline thereafter. The second test period was the two-year period of 2002 and 2003, which was characterized by a volatile market at the bottom of the decline but generally ended where it begun. Thus, the two test periods were quite different from the selection period, and each in its own way provides a test of the durability of the HPCs. The periods are alike in that they both include significant downturns. They are good determinants of whether the HPCs can sustain superior performance in uncertain markets.

REPLICATION OF THE 1997–2001 TESTS – TOTAL ASSET MANAGEMENT, PROFITABILITY, FINANCIAL RISK, AND CASH FLOW EFFICIENCY DRIVERS AND MEASURES

As a first step, we replicated the tests in the prior study with the following differences:

1. We included the companies from the resulting samples described above.
2. We added operating asset performance drivers and measures.

Tables 1a and b compare the HPCs with the S&P companies on performance drivers and performance measures related to the objectives of total asset management, profitability, financial risk, and cash flow efficiency for the period 1997–2001. These tables show the percentage differences and the absolute measures, respectively, of HPCs versus S&P companies. Tables 1c and d show the same measures for HPCs and S&P companies for 2002–2003. The results are summarized as follows:

1. The four selected industry analyses for 1997–2001 (Tables 1a and b) show consistent results across all drivers and measures, with the one exception of growth in revenues for industry 73. HPCs have better utilization of assets (asset turnover), are more profitable (profit margin and return of assets), and have lower financial risk (debt to equity and return on equity), except for industries 35 and 73. Cash flow yield is lower across the four industries, but cash flow returns are consistently higher for the HPCs across the four industries. Using the *t*-test, 33 of the 44 cells are significant at least at the 0.05 level or better, including all cells related to profit margin, return on assets, return on equity, and cash flow return on assets, with two exceptions.

Table 1a. Difference between HPCs and S&P Companies – 1997–2001.

Industry	Performance Drivers				Performance Measures						
	Asset Turnover (%)	Profit Margin (%)	Debt to Equity (%)	Cash Flow Yield (%)	Growth in Revenues (%)	Return on Assets (%)	Return on Equity (%)	Cash Flow Return on Sales (%)	Cash Flow Returns on Total Assets (%)	Cash Flow Returns on Stockholders' Equity (%)	Free Cash Flow (%)
28	2.33	141.07	−4.50	−71.08	49.82	51.33	59.26	59.71	35.76	38.35	22.20
t-test	0.283844	0.020772	0.441803	0.001437	0.008093	0.000003	0.000103	0.005259	0.000004	0.010520	0.000364
35	38.47	68.70	22.56	−66.40	83.23	70.14	74.67	27.42	54.48	63.38	40.96
t-test	0.021173	0.000033	0.263660	0.224446	0.016299	0.000294	0.003363	0.024051	0.006256	0.011389	0.000030
38	2.19	28.70	−34.14	−150.22	75.45	27.29	13.27	24.69	24.55	8.28	16.45
t-test	0.345598	0.031336	0.076629	0.459220	0.002544	0.035556	0.149914	0.042926	0.011327	0.206893	0.014860
73	20.58	68.06	17.04	−47.39	−9.89	55.70	48.80	17.66	24.63	40.73	15.69
t-test	0.081286	0.000597	0.249070	0.197858	0.291960	0.000517	0.001639	0.071635	0.009881	0.003059	0.111085
All	18.23	83.71	−117.70	−149.53	48.38	62.79	54.32	32.47	41.47	32.66	29.38
t-test	0.000350	0.000000	0.013937	0.059797	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Table 1b. HPCs and S&P Companies Compared – 1997–2001.

	Performance Drivers				Performance Measures						
	Asset Turnover	Profit Margin	Debt to Equity	Cash Flow Yield	Growth in Revenues	Return on Assets	Return on Equity	Cash Flow Return on Sales	Cash Flow Returns on Total Assets	Cash Flow Returns on Stockholders' Equity	Free Cash Flow
HPCs	1.34	0.14	1.41	1.57	0.14	0.15	0.29	0.19	0.20	0.40	0.24
S&P	1.10	0.02	3.06	3.91	0.07	0.05	0.13	0.13	0.12	0.27	0.17
Difference	0.24	0.12	−1.66	−2.34	0.07	0.09	0.16	0.06	0.08	0.13	0.07
% Difference	18.23	83.71	−117.70	−149.53	48.38	62.79	54.32	32.47	41.47	32.66	29.38
t-test	0.000350	0.000000	0.013937	0.059797	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Table 1c. Difference between HPCs and S&P Companies – 2002–2003.

Industry	Performance Drivers				Performance Measures						
	Asset Turnover (%)	Profit Margin (%)	Debt to Equity (%)	Cash Flow Yield (%)	Growth in Revenues (%)	Return on Assets (%)	Return on Equity (%)	Cash Flow Return on Sales (%)	Cash Flow Returns on Total Assets (%)	Cash Flow Returns on Stockholders' Equity (%)	Free Cash Flow (%)
28	−11.80	89.71	−30.65	−63.87	−20.11	61.68	52.74	44.22	30.37	10.68	22.65
t-test	0.082233	0.003682	0.349526	0.116866	0.452722	0.002273	0.144857	0.011705	0.011166	0.393080	0.040535
35	43.16	106.01	−33.23	−201.60	129.76	101.70	63.85	9.79	51.01	7.39	44.87
t-test	0.096303	0.000042	0.283873	0.168484	0.009168	0.001339	0.101387	0.242547	0.026812	0.434478	0.059492
38	13.35	46.91	−42.01	−48.97	60.55	44.62	35.89	21.10	27.27	17.89	21.27
t-test	0.154524	0.049331	0.031923	0.241137	0.000044	0.033875	0.066032	0.077117	0.025491	0.085375	0.088373
73	16.04	82.16	30.94	57.27	114.65	53.94	107.42	16.18	7.47	33.54	−0.72
t-test	0.276234	0.014507	0.257995	0.155843	0.307810	0.084708	0.003579	0.269515	0.356806	0.047642	0.486428
All	14.00	106.32	−269.14	−9.15	146.19	68.87	62.15	34.51	39.74	8.53	30.08
t-test	0.071080	0.000000	0.020083	0.254492	0.002445	0.000000	0.000050	0.000011	0.000000	0.274603	0.000000

Table 1d. HPCs and S&P Companies Compared – 2002–2003.

	Performance Drivers				Performance Measures						
	Asset Turnover	Profit Margin	Debt to Equity	Cash Flow Yield	Growth in Revenues	Return on Assets	Return on Equity	Cash Flow Return on Sales	Cash Flow Returns on Total Assets	Cash Flow Returns on Stockholders' Equity	Free Cash Flow
HPCs	1.13	0.13	1.27	3.06	0.06	0.11	0.23	0.21	0.17	0.35	0.19
S&P	0.97	−0.01	4.69	3.34	−0.03	0.03	0.09	0.14	0.10	0.32	0.14
Difference	0.16	0.14	−3.42	−0.28	0.08	0.08	0.14	0.07	0.07	0.03	0.06
% Difference	14.00	106.32	−269.14	−9.15	146.19	68.87	62.15	34.51	39.74	8.53	30.08
t-test	0.071080	0.000000	0.020083	0.254492	0.002445	0.000000	0.000050	0.000011	0.000000	0.274603	0.000000

2. In the period 1997–2001 (Tables 1a and b), HPCs exceeded S&P 500 companies on an overall basis on the performance drivers of asset turnover (by 18.23%) and profit margin (by 83.71%). These drivers produced growth in revenues for the HPC group that exceeded the S&P average by 44.38% and that exceeded the S&P return on assets by 62.79%. All differences overall were significant at the 0.0001 level or better.
3. As in the previous study, financial risk as measured by debt to equity was much less for HPCs than for S&P companies. This result was expected due to the HPCs' lower need for debt financing. The result of this reduced debt to equity was that return on equity, while still greater for HPCs by 54.32%, differed less than return on assets. The difference in debt to equity was significant at the 0.05 level, and all other differences were significant at the 0.0001 level or better.
4. Cash flow yield was also lower for HPCs than for S&P companies, as in the previous study. This period produced lower relative performance measures for HPCs for cash returns on total assets and cash flow returns on stockholders' equity, but the measures were still significantly above those of the S&P companies. All cash flow returns differences were significant at the 0.0001 level or better.

In summary, HPCs were shown to maintain superior asset management, performance profitability, lower financial risk, and stronger cash flow returns over an economic period that contained a market peak. These findings, based on the refinement of the sample as explained previously, fully confirmed the conclusions of our earlier work.

EXTENSION OF TESTS TO 2002–2003: TOTAL ASSET MANAGEMENT, PROFITABILITY, FINANCIAL RISK, AND CASH FLOW EFFICIENCY DRIVERS AND MEASURES

This study addressed a second issue: whether the HPCs could sustain their superior performance three to four years beyond the selection period. The period 2002–2003 is a good test period for the sustainability of superior performance by HPCs because it represents a contrasting trough in the market cycle from the 1997–2001 cycle. Our expectation was that the HPCs would continue to outperform the S&P companies in this period, which is three to four years after the bull market that characterized the selection period. Tables 1c and d show the measures for 2002–2003 for total asset

management, profitability, financial risk, and cash flow efficiency drivers and measures. The following observations may be made:

1. For this period, the four-industry analysis shows similar results in favor of the HPCs, especially in the profit margin driver and the return on assets measure. Overall, 18 of the 44 cells have differences that are significant at least at the 0.05 level or better. These results would seem to indicate that HPCs in these industries are maintaining their position, although with more variation, relative to their respective industries on the objectives of profitability.
2. HPCs in the four industries continue to have lower debt to equity ratios and thus lower financial risk but continue to have superior return on equity. They also have mixed results with regard to cash flow yield, but do generate superior cash flow returns.
3. When all HPCs are compared with the S&P companies, the HPCs demonstrate strongly superior results, with the exception of cash flow yield (consistent with the 1997–2001 period). All differences are significant at the 0.0001 level or better, with the exception of asset turnover (0.07) and debt to equity (0.02).

These results strongly support the proposition that HPCs maintain superior performance with regard to total asset management, profitability, financial risk, and cash flow efficiency drivers.

EFFECT OF OUTLIERS

As a further test of the model, we examined the effect of outliers on the results by repeating the tests described above but excluding outliers that were more than one standard deviation from the mean. The elimination of outliers did not change the conclusions reached in examining the full set of data. This test established the same patterns in 1997–2001 as shown in Tables 1a and b, except for asset turnover, which showed a non-significant difference of 2.90% in favor of the HPCs. All other differences are significant at the 0.0001 level or better, with the exception of cash flow yield at 0.02. The period 2002–2003 showed the same strong sustainable performance of the HPCs over the S&P companies as presented in Tables 1c and d. As for the 1997–2001 period, the difference in asset turnover, although favoring the HPCs by 14%, is not significant. However, all other differences are significant at the 0.0001 level or better, except for cash flow yield at 0.002.

OPERATING ASSET MANAGEMENT: 1997–2001

As previously explained, our prior study did not address operating asset management. The goal of liquidity is closely related to the goal of operating asset management. Operating asset management is a measure of management control of the cash conversion cycle, which is the time required to make or buy products, finance the products, and sell and collect for them. Operating asset management is the ability to utilize current assets and liabilities in a way that supports growth in revenues with minimum investment. The drivers of operating asset management are the turnover ratios, and the performance measures are the days represented by each turnover measure, as follows:

Performance Driver	Performance Measure
Receivables turnover	Days' sales uncollectible
Inventory turnover	Days' inventory on hand
Payables turnover	Days' payable

Taken together, the performance measures give an indication of the financing period, as shown by the following formula:

$$\text{Financing period} = \text{days' receivable} + \text{days' inventory on hand} - \text{days' payable}$$

The financing period represents the amount of time during which a company must provide financing for its operating activities.

Tables 2a and b compare HPCs with S&P companies for the period 1997–2001. Tables 2c and d provide the same comparisons for the 2002–2003 period. Our expectation was that HPCs would have a shorter financing period than S&P companies because their superior financial performance would be a reflection of their operating efficiency. The results may be summarized as follows:

1. The financing period for HPCs was shorter in three of the four industries for both periods. Industry 28 was the only exception. Table 2b shows that the financing period for the HPC group was shorter by 46.45% for the 1997–2001 period, which equates to almost 28 fewer days that need financing, thus lowering the financing costs for HPCs relative to S&P companies. Table 2d shows HPCs, overall, maintaining this favorable positioning, with a financing period for 2002–2003 that was 67.05%, or 30.0 days, better than that for the S&P companies.

Table 2a. Operating Assets Management – 1997–2001.

Industry	Performance Drivers			Performance Measures			
	Receivables Turnover (%)	Inventory Turnover (%)	Payables Turnover (%)	Days' Sales Uncollected (%)	Days' Inventory on Hand (%)	Days' Payable (%)	Financing Period (%)
28	218.64	−27.67	−97.55	184.29	21.67	49.38	76.55
t-test	0.114721	0.008543	0.000003				
35	24.29	84.64	15.53	−32.09	−550.96	−18.39	−402.70
t-test	0.015240	0.007717	0.128120				
38	14.08	6.24	−4.29	−16.39	−6.65	4.11	−15.02
t-test	0.015517	0.355498	0.300986				
73	−31.63	68.47	−20.44	24.03	−217.16	16.97	−48.65
t-test	0.037704	0.000000	0.312053				
All	2.32	31.61	−6.06	−2.37	−46.21	5.72	−46.45
t-test	0.451464	0.006391	0.258015				

Table 2b. Operating Assets Management – 1997–2001.

	Performance Drivers			Performance Measures			
	Receivables Turnover	Inventory Turnover	Payables Turnover	Days' Sales Uncollected	Days' Inventory on Hand	Days' Payable	Financing Period
HPCs	8.20	6.90	9.64	44.52	52.90	37.85	59.57
S&P	8.01	4.72	10.23	45.57	77.35	35.69	87.24
Difference	0.19	2.18	−0.58	−1.06	−24.45	2.16	−27.67
% Difference	2.32	31.61	−6.06	−2.37	−46.21	5.72	−46.45
t-test	0.451464	0.006391	0.258015				

Table 2c. Operating Assets Management – 2002–2003.

Industry	Performance Drivers			Performance Measures			
	Receivables Turnover (%)	Inventory Turnover (%)	Payables Turnover (%)	Days' Sales Uncollected (%)	Days' Inventory on Hand (%)	Days' Payable (%)	Financing Period (%)
28	−11.55	−55.39	−101.76	10.36	35.65	50.44	10.36
t-test	0.315060	0.005728	0.000016				
35	25.22	81.95	18.77	−33.73	−454.07	−23.10	−590.54
t-test	0.164705	0.086579	0.271519				
38	8.03	12.59	−8.27	−8.73	−14.40	7.63	−20.00
t-test	0.291031	0.317617	0.228576				
73	−33.31	62.92	−10.99	24.99	−169.66	9.90	−43.87
t-test	0.143875	0.019459	0.373657				
All	−14.18	32.15	−25.15	12.42	−47.39	20.10	−67.05
t-test	0.134794	0.040869	0.008278				

Table 2d. Operating Assets Management – 2002–2003.

	Performance Drivers			Performance Measures			
	Receivables Turnover	Inventory Turnover	Payables Turnover	Days' Sales Uncollected	Days' Inventory on Hand	Days' Payable	Financing Period
HPCs	9.66	6.83	7.85	37.78	53.47	46.51	44.73
S&P	11.03	4.63	9.82	33.09	78.81	37.17	74.73
Difference	−1.37	2.19	−1.97	4.69	−25.34	9.35	−30.00
% Difference	−14.18	32.15	−25.15	12.42	−47.39	20.10	−67.05
t-test	0.134794	0.040869	0.008278				

2. The operating asset turnover ratios, however, show more variability among industries and between HPCs and S&P companies. We expected HPCs to outperform S&P companies on receivables turnover, and this was the case generally for the 1997–2001 period, as shown in Table 4a, for each of the selected industries except industry 73; however, overall, the HPCs advantage was a nonsignificant 2.32%. This result could be accounted for by the fact that HPCs have less need to sell receivables and take advantage of off-balance-sheet financing than S&P companies. Further, as seen below, HPCs are better able to take advantage of trade creditors.
3. The 2002–2003 period shows more variability in the turnover ratios, but overall, the HPCs improved their performance in relation to the S&P companies. The HPCs declined in receivables turnover relative to the S&P companies, but the differences are not significant. Except for industry 28, the inventory turnover ratios for both periods are in line with our expectations that the HPCs would outperform the S&P companies. Inventory turnover for HPCs in the 1997–2001 period exceeded that of S&P companies by 31.61% (significant at the 0.007 level), which represents 24.45 fewer days of financing needed, more than offsetting the shortfall from receivables. These results are in line with our expectations.
4. For the 1997–2001 period, HPCs have a payable turnover that is only 6.06% (not a significant difference) lower than that of S&P companies. However, the HPCs were able to increase their performance in the 2002–2003 period to an advantage of 25.25%, or 9.35 days. Strong operating results and low debt loads of HPCs enable these companies to obtain longer terms than average from their trade creditors, which accounts for most of the difference. The HPCs in industry 28 have the strongest payables turnover among the four industries relative to the S&P companies, with a difference that is significant at the 0.0001 level or better. Thus, the

HPCs' deficiencies noted above in receivables and inventory are overcome, so that these companies outperform their industry on the financing period.

In summary, HPCs excel at inventory management, push their creditors to the limit, and are willing to accept a higher level of receivables. Overall, the result of their superior operating asset management is a financing period that is 28–30 days shorter than that of S&P companies.

CASH FLOW YIELD AND FREE CASH FLOWS

We have posited cash flow yield as a driver of cash flow performance measures. We have done this on the basis that cash flow yield expresses the relationship of profitability to liquidity, as shown in the following equations:

$$\text{Cash flow yield} = \text{cash flows from operating activities/net income}$$

$$\text{Cash flow return on sales} = \text{cash flow yield} \times \text{profit margin}$$

$$\text{Cash flow return on assets} = \text{cash flow yield} \times \text{return on assets}$$

$$\text{Cash flow return on equity} = \text{cash flow yield} \times \text{return on equity}$$

In contrast, free cash flows, as measured by cash flows from operating activities less net capital expenditures, is probably the most popular cash flow performance measure used by financial analysts. For these analysts, a positive figure for free cash flows shows that the company is able to maintain its capital base and thus have funds for other purposes. However, in our previous paper (Needles et al., 2004) we identified four deficiencies in the cash flows measure, as follows:

1. No accepted definition exists as to what free cash flows are.
2. Free cash flows are not a ratio; they represent an absolute amount. Thus, interpretation is difficult because relative size is not taken into account.
3. It is not even clear that large free cash flows are good and that small or negative ones are bad. Large free cash flows may mean that the company is not investing sufficiently. Negative free cash flow may mean the company is making large capital expenditures that are expected to produce increased future cash flows. No benchmark exists to compare or judge free cash flows.
4. The only truly "free" cash flows are cash flows from operations, because management is "free" to use them in a variety of ways:
   a. Invest for future cash flows: net capital expenditures or acquisitions
   b. Save for future use: investments in securities

c. Reduce financial risk: paying down short-term or long-term debt
d. Reduce the size of the business: paying dividends or buying back stock

How management chooses to use the cash flows from operating activities will affect the future cash flows from operating activities and hence the value of the company. Free cash flows in the traditional sense do not give information about the value of the company. It is cash flows from operating activities that represent the cash flow stream that should be discounted. Since cash flows from operating activities stem from profitable operations, the cash flow yield is the fulcrum or leverage that a company uses to create value.

Our research has not supported the proposition that the HPCs will have cash flow yields superior to those of S&P companies. Cash flow yield shows inconsistent results for the 1997–2001 and 2002–2003 periods, but, overall, for both periods the yields of S&P companies exceed those of the HPCs by amounts that are significant at the 0.05 level. We believe that one reason for this anomaly is that the income for S&P companies is low compared with income for the HPCs. In Table 1b, for instance, profit margin in 1997–2001 for S&P companies is only 2%, versus 14% for HPCs. In the 2002–2003 period (Table 1d), the S&P companies on average actually had a loss of 1%, versus a profit margin of 13% for the HPC group. Since the denominator of the cash flow yield is net income, a low number would tend to produce high cash flow yield results.

A second reason for this anomaly is that the ratio is sensitive to changes in a company's ability to generate cash from its operations. When net income is low due to non-operating items such as impairment and restructuring charges, which is often the case for non-HPCs, the cash flow yield can give a false positive signal. To test the extent of nonoperating items in S&P companies versus HPCs, we computed the following ratio for companies where net income is positive:

$$\text{Net income} - \text{operating income after taxes}/\text{net income}$$

Table 3. Effect of Nonoperating Items (Negative Incomes Excluded).

Industry	(Net Income – Operating Income After Taxes)/Net Income					
	1997–2001			2002–2003		
	t-test	HPCs	S&P 500	*t*-test	HPCs	S&P 500
28	0.005279	−0.05	−0.57	0.025624	−0.24	−0.75
35	0.004386	−0.06	−0.67	0.035620	−0.11	−1.60
38	0.223838	−1.53	−3.98	0.106425	−0.21	−0.75
73	0.049680	0.05	−0.10	0.052732	0.26	−0.27
All	0.000036	−0.19	−1.79	0.000000	−0.10	−0.93

Table 4. Analysis of Cash Flow Yield.

Industry	1997–2001				2002–2003			
	t-test	Cash Flow Yield Difference (%)	HPCs	S&P	*t*-test	Cash Flow Yield Difference (%)	HPCs	S&P
(*a*) *Cash flow yield with no negative incomes*								
28	0.000862	−71.08	1.28	2.19	0.009536	−63.87	1.44	2.36
35	0.008832	−66.40	1.70	2.82	0.020294	−201.60	1.55	4.68
38	0.175060	−150.22	2.44	6.11	0.121938	−48.97	1.65	2.45
73	0.000065	−47.39	1.47	2.17	0.221872	57.27	11.84	5.06
All	0.000000	−149.53	1.57	3.91	0.411044	−9.15	3.06	3.34
(*b*) *Cash flow yield with no outliers*								
28	0.001486	−79.16	0.95	1.71	0.110784	−64.77	0.91	1.51
35	0.069470	30.30	1.70	1.18	0.491507	0.46	1.55	1.54
38	0.403189	4.51	1.57	1.50	0.342690	7.00	1.65	1.53
73	0.197858	14.75	1.47	1.26	0.073595	−21.93	1.54	1.88
All	0.017745	−15.35	1.38	1.59	0.033630	−22.19	1.41	1.72
(*c*) *Cash flow yield with no negative incomes and no outliers*								
28	0.000066	−59.79	1.24	1.98	0.024796	−34.93	1.44	1.94
35	0.002612	−49.69	1.55	2.31	0.000020	−86.30	1.55	2.89
38	0.025395	−32.53	1.57	2.08	0.259873	−10.74	1.65	1.82
73	0.000065	−47.39	1.47	2.17	0.000062	−54.72	1.54	2.38
All	0.000000	−71.26	1.42	2.43	0.000000	−52.86	1.59	2.43

Our analysis excluded cases in which a net loss (negative net income) existed. The findings, which are provided in Table 3, show that the S&P companies have large amounts of negative nonoperating items relative to HPC companies. In the 1997–2001 period, these items for S&P companies were 179% of net income, whereas they were only 19% of net income for the HPCs. When, as is often the case, these negatives are ''added back'' to net income in determining cash flows from operating activities, they will sway the cash flow yield in the direction of the S&P companies. The 2002–2003 period shows similar results. The nonoperating items are 93% of net income for S&P companies and only 10% of net income for HPCs. We also performed this analysis without excluding negative incomes, with the result that the same relationships held, but the *t*-tests were not as significant.

Finally, we tested the sensitivity of the cash flow yields to outliers and negative incomes by comparing HPCs with S&P companies under three conditions. First, cash flow yield is calculated without negative incomes (Table 4a). This test produced consistent results except for industry 73 in 2002–2003, which is the only cell in which cash flow yield for HPCs exceeded that of S&P companies. Second, cash flow yield is calculated without outliers (Table 4b). This test produced inconsistent results. Third, cash flow yield is calculated without negative incomes and outliers (Table 4c). This test produced the most consistent results. In all cases, S&P companies produced higher cash flow yields than HPCs, and, except for industry 38 the differences are significant. Overall, the S&P companies exceeded HPCs on cash flow yield by 71.26% for 1997–2001 and by 52.86% for 2002–2003. The differences are significant at the 0.0001 level or better.

These results, while not consistent with our original expectations, are understandable in light of low incomes and nonoperating items such as losses that cause non-HPCs generally to have higher cash flow yields than higher-performing HPC. However, as shown in Tables 1 and 2, HPCs' superior profitability when combined with their lower cash flow yields produces significantly superior cash flow performance measures. These results also support the premise that it is always important to examine the details of the operating section when interpreting the cash flow yield.

CONCLUSION

We began this research with four objectives: (1) replicate the previous study with certain modifications, (2) determine the sustainability of performance by HPCs, (3) identify operating asset management characteristics, especially

as they relate to the cash cycle, and (4) explain anomalies in the measures of cash flow yield. We have observed the following:

1. The results of our previous research were confirmed through a replication of the previous study with modifications of the sample and tests.
2. HPCs are able to sustain superior performance beyond the selection period and through differing market conditions.
3. HPCs display superior operating asset management as measured by the length of the financing period, although their performance across the three components of the measure is variable.
4. With lower net income and higher proportions of nonoperating negatives in relation to net income versus HPCs, S&P companies can be expected to have higher cash flow yields.
5. HPCs produce superior cash flow returns through superior asset management and profitability, but they also have lower financial risk as represented by lower debt to equity ratios, which tend to moderate the returns on equity and cash flows returns on equity.

This study, which is a part of ongoing research in the area of strategy and financial performance measurement, has several limitations, some of which we expect to study in future research. First, we were restricted to two SIC codes because of the small sample size. This was due to our confining our sample to S&P 500 companies. If we expand our sample size sufficiently to analyze at the three-digit SIC level, we expect to find similar results. Second, our individual industry studies included only four industries. That's because no industry other than these four had more than three HPC members. Third, we limited our ratio analysis to the items from the database without adjustment. For example, we did not adjust cash flow from operating activities for one-time operating or nonoperating items.

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APPENDIX A. FORMULAS FOR RATIO COMPUTATIONS

Performance Drivers

- Asset turnover: Net sales/average total assets
- Profit margin: Net income/net sales
- Debt to equity: (Total assets−stockholders' equity)/stockholders' equity
- Cash flow yield: Cash flows from operating activities/net income
- (In the analysis, if either the numerator or denominator of the cash flow yield was negative, the ratio was excluded.)

Valuation Performance Measures

- Growth in revenues: Change in net sales/net sales
- Return on assets: Net income/average total assets
- Return on equity: Net income/average stockholders' equity
- Cash flow returns: Cash flows from operating activities/average total assets and Cash flows from operating activities/average stockholders' equity
- Free cash flow: Cash flows from operating activities – dividends + sales of capital assets – purchases of capital asset. (In the analysis, to adjust for size of company, free cash flow was divided by average total assets.)

Operating Asset and Financing Ratios

- Receivables turnover: Net sales/average accounts receivable
- Average days' uncollected: 365/receivables turnover
- Inventory turnover: Cost of sales/average accounts inventory
- Average days' inventory on hand: 365/inventory turnover
- Payables turnover: (Cost of sales ± change in inventory)/average accounts payable
- Average days' payable: 365/payables turnover
- Financing period: Average days' sales uncollected + average days' inventory on hand−average days' payable

APPENDIX B. HIGH-PERFORMANCE COMPANIES

Company Symbol	SIC Code	Description
ABT	2834	*Abbott Laboratories*. This company is a leading maker of drugs, nutritionals, and hospital and laboratory products
ADP	7374	*Automatic Data Processing, Inc*. ADP, one of the world's largest independent computing services companies, provides a broad range of data-processing services
AMGN	2836	*Amgen Inc.* The world's leading biotech company, Amgen has major treatments for anemia, neutropenia, rheumatoid arthritis, and psoriatic arthritis
AXP	6199	*American Express Company.* This company, a leader in travel-related services, is also active in investment services, expense management services, and international banking
AZN	2834	*AstraZeneca PLC*. Formed through the April 1999 merger of Zeneca Group PLC, of the UK, and Astra AB, of Sweden, AZN ranks among the world's leading drug companies
BBBY	5700	*Bed Bath & Beyond Inc*. BBBY operates a nationwide chain of nearly 400 superstores selling better-quality domestics merchandise and home furnishings at prices below those offered by department stores
BVF	2834	*Biovail Corporation*. This company is engaged in formulation, clinical testing, registration, and manufacturing of drug products using advanced drug-delivery technologies
CTAS	2320	*Cintas Corporation*. This leader in the corporate identity uniform business also provides ancillary services including entrance mats, sanitation supplies, and first-aid products and services

APPENDIX B. (*Continued*)

Company Symbol	SIC Code	Description
DELL	3571	*Dell Computer Corporation*. Dell is the leading direct marketer and one of the world's 10 leading manufacturers of PCs compatible with industry standards established by IBM
DHR	3823	*Danaher Corporation*. This company is a leading maker of tools, including Sears Craftsman hand tools, and of process/environmental controls and telecommunications equipment
ESRX	6411	*Express Scripts, Inc*. This company offers prescription benefits, vision care, and disease management services
FNM	6111	*Fannie Mae*. FNM, a U.S. government-sponsored enterprise (GSE), uses mostly borrowed funds to buy a variety of mortgages, thereby creating a secondary market for mortgage lenders
FRX	2834	*Forest Laboratories, Inc*. This company develops and makes branded and generic ethical drug products, sold primarily in the U.S., Puerto Rico, and western and eastern Europe.
GE	9997	*General Electric Company*. This industrial and media behemoth is also one of the world's largest providers of financing and insurance
GPS	5651	*The Gap, Inc*. This specialty apparel retailer operates The Gap Stores, Banana Republic, and Old Navy Clothing Company, offering casual clothing to upper-level, moderate-level, and value-oriented market segments
HD	5211	*The Home Depot, Inc*. HD operates a chain of more than 1,400 retail warehouse-type stores, selling a wide variety of home improvement products for the do-it-yourself and home remodeling markets
HDI	3751	*Harley-Davidson, Inc*. This leading maker of heavyweight motorcycles also produces a line of motorcycle parts and accessories

APPENDIX B. (*Continued*)

Company Symbol	SIC Code	Description
INTC	3674	*Intel Corporation*. Intel is the world's largest manufacturer of microprocessors, the central processing units of PCs, and also produces other products that enhance PC capabilities
ITW	3540	*Illinois Tool Works Inc*. ITW operates a portfolio of more than 600 industrial and consumer businesses
JNJ	2834	*Johnson & Johnson*. The world's largest and most comprehensive health care company, JNJ offers a broad line of drugs, consumer products, and other medical and dental items
JNY	2330	*Jones Apparel Group, Inc*. This company is the world's largest manufacturer of women's apparel, footwear, and accessories, with brands such as Jones New York, Nine West, Rena Rowan, and Evan-Picone
KO	2080	*The Coca-Cola Company*. Coca-Cola is the world's largest soft-drink company and has a sizable fruit juice business. Its bottling interests include a 40% stake in NYSE-listed Coca-Cola Enterprises
LLY	2834	*Eli Lilly and Company*. This major worldwide maker of prescription drugs produces Prozac antidepressant, Zyprexa antipsychotic, diabetic care items, antibiotics, and animal health products
MDT	3845	*Medtronic, Inc*. This global medical-device manufacturer has leadership positions in the pacemaker, defibrillator, orthopedic, diabetes management, and other medical markets
MRK	2834	*Merck & Co., Inc*. Merck is one of the world's largest prescription pharmaceuticals concerns. The company plans to spin off its Medco PBM subsidiary
MSFT	7372	*Microsoft Corporation*. Microsoft, the world's largest software company, develops PC software, including the Windows operating system and Office application suite

APPENDIX B. (*Continued*)

Company Symbol	SIC Code	Description
MXIM	3674	*Maxim Integrated Products, Inc*. This company is a worldwide leader in the design, development, and manufacture of linear and mixed-signal integrated circuits
OMC	7311	*Omnicom Group Inc*. OMC owns the DDB , BBDO , and TBWA worldwide advertising agency networks; it also owns more than 100 marketing and specialty services firms.
ORCL	7372	*Oracle Corporation*. This company is the world's largest supplier of information-management software
PAYX	8721	*Paychex, Inc*. This company provides computerized payroll accounting services to small- and medium-size concerns throughout the U.S.
PFE	2834	*Pfizer Inc*. PFE, the world's largest drug company, with about 11% of the global market, acquired Pharmacia in April 2003, in exchange for 1.8 billion PFE shares
PII	3790	*Polaris Industries Inc*. This company manufactures snowmobiles, all-terrain vehicles, personal watercraft, motorcycles, and related accessories for recreational and/or utility use
RHI	7363	*Robert Half International Inc*. RHI is the world's largest specialized provider of temporary and permanent personnel in the fields of accounting and finance
SGP	2834	*Schering–Plough Corporation*. This company is a leading producer of prescription and over-the-counter pharmaceuticals and has important interests in sun-care, animal-health, and foot-care products
SYK	3842	*Stryker Corporation*. Stryker makes specialty surgical and medical products such as orthopedic implants, endoscopic items, and hospital beds and operates a chain of physical therapy clinics

APPENDIX B. (*Continued*)

Company Symbol	SIC Code	Description
SYY	5140	*Sysco Corporation*. Sysco is the largest U.S. marketer and distributor of food-service products, serving about 415,000 customers
WMT	5331	*Wal-Mart Stores, Inc*. Wal-Mart is the largest retailer in North America, operating a chain of discount department stores, wholesale clubs, and combination discount stores and supermarkets
WYE	2834	*Wyeth*. This company (formerly American Home Products Corporation) is a leading maker of prescription drugs and over-the-counter medications