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FINANCIAL STATEMENT ANALYSIS AND THE PREDICTION OF STOCK RETURNS*

Jane A. OU

Santa Clara University, Santa Clara, CA 95053, USA

Stephen H. PENMAN

University of California, Berkeley, CA 94720, USA

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This paper performs a financial statement analysis that combines a large set of financial statement items into one summary measure which indicates the direction of one-year-ahead earnings changes. Positions are taken in stocks on the basis of this measure during the period 1973–1983, which involve cancelling long and short positions with zero net investment. The two-year holding-period return to the long and short positions is in the order of 12.5%. After adjustment for 'size effects' the return is about 7.0%. These returns cannot be explained by nominated firm risk characteristics.

1. Introduction

Financial statement analysis identifies aspects of financial statements that are relevant to investment decisions. One goal of the analysis is to assess firm value from financial statements. Much empirical accounting research has attempted to discover value-relevant accounting attributes in order to enhance financial statement analysis. The approach taken in this work assumes that market price is sufficient for determining firms' values and thus serves as a benchmark against which to evaluate the information in accounting measures. Accounting attributes are inferred to be value-relevant because they are contemporaneously statistically associated with stock prices. For example, the seminal work of Ball and Brown (1968) and the many successive 'information content' papers indicate that accounting earnings and some of its components capture information that is contained in stock prices.

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Traditional 'fundamental analysis', however, embraces a different perspective. Firms' ('fundamental') values are indicated by information in financial statements. Stock prices deviate at times from these values and only slowly gravitate towards the fundamental values. Thus, analysis of published financial statements can discover values that are not reflected in stock prices. Rather than taking prices as value benchmarks, 'intrinsic values' discovered from financial statements serve as benchmarks with which prices are compared to identify overpriced and underpriced stocks. Because deviant prices ultimately gravitate to the fundamentals, investment strategies which produce 'abnormal returns' can be discovered by the comparison of prices to these fundamental values.

There have been many claims of market efficiency with respect to 'publicly available' accounting information, but (astonishingly, when one considers the many tests of technical analysis) little research into the competing claim of fundamental analysis.[1] This paper examines this claim. We outline a method of financial statement analysis that extracts a summary value measure from financial statements. This measure is an indicator of the direction of future earnings. Positions are taken in stocks on the basis of this measure and returns to the positions are observed. These procedures approximate the program of traditional fundamental analysis of discovering value-relevant attributes of firms from financial statements and taking market positions based on these. The results indicate that the summary measure robustly predicts future stock returns. Trading strategies based on predictions of future earnings from 'publicly available' financial statement information capture a significant portion of returns to the Ball and Brown (hypothetical) strategy based on perfect foreknowledge of those future earnings. Further, the returns to these strategies are not explained by aspects of firms that have been nominated as risk attributes.

In the next section we describe our financial statement analysis that extracts the summary value measure from financial statements. We also outline our preset program for utilizing this measure in investment strategies. Then, after summarizing the data in section 3, we describe the results of the execution of the program in section 4. Section 5 examines the extent to which returns predicted by the value measure are explained by firms' conjectured risk characteristics. Finally, a short summary of the results is given in section 6.

2. The approach

The tests in the paper involve observation of returns to investment strategies based on a measure that summarizes information in financial statements. In

[1] Many papers examine the ability of 'fundamentals' to predict returns, but test trading rules suggested by those with experience with the data on the same data from which that experience was gained. Exceptions are McKibben (1972) and Oppenheimer (1981).

this section we describe the financial statement analysis that produces this measure and outline features of the trading strategy that employs it.

2.1. The financial statement analysis

Fundamental analysis maintains that firms' values are indicated by information in financial statements. However, the methods by which these values are extracted from financial statements are unclear. Traditional financial statement analysis provides little guidance for this task. Textbooks describe the calculation of financial statement ratios but provide scant prescription as to how these should be used. Ratios are identified with such constructs as 'profitability', 'turnover', and 'liquidity', but the relationship of these operating characteristics to value is not apparent. Our financial statement analysis is an attempt to operationalize the notion of extracting values from financial statements. The large array of financial statement items are combined into a scalar that maps from the financial statements to the payoffs to securities.

A simple valuation model can be expressed as

$$V = \mathrm{E}(d)/r, \tag{1}$$

where V is a stock's value (equal to price in an efficient market), $\mathrm{E}(d)$ is expected future dividends, and r the rate at which future dividends are discounted. The discount rate reflects security risk. Both $\mathrm{E}(d)$ and r are assessed on the basis of financial statement and other information available. Thus, for determining firm values [and for taking market positions on the basis of information about either $\mathrm{E}(d)$ or r], the analyst desires to distinguish those accounting attributes that indicate positive-value expected payoffs in the numerator of (1) from those that indicate negative-value risk characteristics in the denominator.[2] We have in mind an accounting indicator of the numerator. Thus we identify those financial statement attributes that are correlated with future payoffs and combine these into one 'positive-value' measure. This approach is in contrast to but complements the financial statement analysis of Beaver, Kettler, and Scholes (1970) and Rosenberg and Marathe (1975), which seeks to discover financial statement measures that are related to risk [in the denominator of (1)] and which thus predict expected stock returns. As firm risk is not well-understood, one cannot guarantee that our measure will not reflect risk, but the procedure is likely to reduce the possibility.[3] As a check we

[2] There is some license taken with terminology here. In the theory of valuation under uncertainty [Rubinstein (1976)], risk adjustments appear in the numerator rather than the denominator. See also Ohlson (1988).

[3] An alternative way to proceed might be to discover those financial statement items that predict future stock returns directly [as in McKibbon (1972), for example]. This, however, poses an identification problem: if these items predict cross-sectional differences in stock returns, one cannot ascertain whether they distinguish differential expected returns due to risk differences or whether they predict 'abnormal' returns due to mispricing of fundamentals in the market. Our approach is an attempt to reduce this identification problem.

investigate whether returns predicted by the measure can be explained by firm characteristics that have been suggested as risk attributes in the literature.

The critical task in the endeavor is the identification of payoff indicators in the financial statements. Valuation theory [of which (1) is a crude representation] indicates that observables should be identified on the basis of their correlation with future dividends [see Rubinstein (1976) and Garman and Ohlson (1980)]. Unfortunately, the available history of dividend payouts is such that one cannot observe the full set of realizations of dividends that investors perceive as possible in their ex ante assessments. Indeed, Miller and Modigliani (1961) results suggest that payouts, exclusive of liquidation dividends (which typically are not observed), are arbitrary and unrelated to value, or driven by tax considerations. We are impressed, however, by one of the most robust results in empirical research in accounting, namely the Ball and Brown (1968) finding that accounting earnings are valued positively by investors. Higher (lower) earnings imply higher (lower) values. We are guided also by the intuition that future dividends are 'paid out of earnings'. Thus we identify future earnings as a value-relevant attribute of interest. Note that Grahamite principles stress the notion of 'future earnings power' as the most important valuation notion.[4]

Given future earnings are value-relevant, it is desirable to identify financial descriptors on the basis of their ability to predict earnings for many years in the future. We limit our investigation to one-year-ahead earnings. The disregard for information about earnings more than one year ahead produces a conservative bias to our tests, that is, towards the null hypothesis of market efficiency. The following year's earnings variable is specified as a binary outcome, an earnings increase or an earnings decrease. Thus financial statement descriptors published in a given annual report are selected on the basis of their ability to predict the direction of the annual earnings change in the following year. There is a loss of information in the binary specification, but we were concerned that, given outliers common to accounting data, estimation with dollar magnitudes might produce parameter estimates that perform poorly in out-of-sample prediction and result in investment strategies that give undue weight to estimation errors. The binary specification also permits a comparison of returns to the trading strategy with those of a Ball and Brown (1968) strategy which is based on perfect foreknowledge of the binary outcome.

Our estimation technique is LOGIT. Selected attributes are parsimoniously incorporated in a LOGIT model which, when estimated, delivers our summary

[4]'The most important single factor determining a stock's value is now held to be the *indicated average future earning power*, i.e., the estimated average earnings for a future span of years. Intrinsic value would then be found by first forecasting this earning power and then multiplying that prediction by an appropriate ' capitalization factor'. Graham, Dodd, and Cottle (1962, p. 28), emphasis in the original.

value measure. This is the estimated probability of an earnings increase in the subsequent year that is indicated jointly by descriptors in the financial statements and the LOGIT model. We denote the estimate of this for a given firm i in fiscal year t as $\hat{P}r_{it}$. We will refer to this as $\hat{P}r$, with the subscripts understood. This measure is an assessment of the relative ability of firms to generate earnings in the subsequent year. Thus it has the character of a 'future earning power' attribute referred to by traditional fundamental analysts.

In estimating $\hat{P}r$, we choose, as the earnings variable in year $t+1$, the change in primary earnings-per-share before extraordinary items. Because earnings increases tend to outnumber earnings decreases, we define the variable as $\text{e.p.s.}_{it+1} - \text{e.p.s.}_{it} - \text{drift}_{it+1}$ to take out the firm-specific trend. The drift term was estimated as the mean earnings-per-share change over the four years prior to year $t+1$.

Because a limited number of observations of accounting variables are available for many individual firms, the LOGIT model is estimated based on data pooled over firms and time. This brings much more information to the estimates of parameters. However, if a general model is not a good representation for all firms (to the extent to which different characteristics generate future earnings in different firms in different ways), we again introduce a conservative bias to the tests.

2.2. *The trading strategy*

Stocks are assigned to investment positions on the basis of these $\hat{P}r$ values. In designing an investment strategy, three principles are followed. First, information not available at the time the investment strategies could actually have been implemented is excluded in an attempt to minimize ex post bias. Second, we follow a fixed, preset program that does not reflect earlier experience with the data. We thus avoid statistical overfitting. Third, the analysis is carried out on a large sample of firms and replicated over a considerable period of time. Thus there is ability to evaluate robustness of results within the sample.

The trading strategy is developed as follows. Steps 1–3 involve the selection of accounting attributes and the consolidation of these into the summary measure. Step 4 involves the utilization of this summary measure in stock selection.

1. During an estimation period, the ability of a large number of financial statement attributes to predict future earnings is assessed by reference to observed correlations in the data. No conscious attempt is made to assess predictive ability on the basis of what we think should work or what we have observed to work from experience. Selected possible predictors are nominated after a survey of financial accounting and financial analysis texts

available at the beginning of the sample period. 'Let the data speak' is the motto here: the predictive ability of the financial statement attributes could have been observed by investors at the end of the estimation period.

2. Weights that combine financial statement attributes (that demonstrate predictive ability in step 1) into the $\hat{Pr}$ summary measure are estimated from the data during the estimation period.
3. Using the selected accounting attributes and estimated weights, $\hat{Pr}$ values are calculated for each stock in the sample from financial statements published for fiscal years after the estimation period.
4. Stocks are then assigned to long and short investment positions on the basis of this measure. The investment strategy is implemented according to a preset program describing execution dates (outside the estimation period and at a point in time when the financial statement attributes were publicly available), cut-off criteria for assignment to positions, weights given to securities in portfolios, and holding periods for the positions.

This approach is a conservative one. Our fixed program is only one of many possible and there is no guarantee that we have selected the best, or even a good one. Further, one might conjecture that had we 'thought a little' about the selection of accounting attributes, results could be 'improved'.

In assessing investment return performance, we do not compare observed returns to benchmarks described by a particular asset pricing model. Rather, we report returns to cancelling long and short positions (requiring zero net investment) which are indicated by the value measure. We then assess whether the returns to this position can be explained by attributes that are popular candidates for risk proxies – estimated market beta, return variance, firm size, earnings yield, market premium over book value, and leverage.

3. The sample

Annual financial statement information is obtained from the COMPUSTAT annual report files. These files contain an extensive list of 'above-the-line' accounting line items. The 1984 COMPUSTAT Annual Primary, Supplementary, and Tertiary File is merged with the 1984 COMPUSTAT Research File (which contains all firms dropped from COMPUSTAT files between 1971 and 1984) to obtain data on the complete set of firms covered by COMPUSTAT from 1970 to 1984. We thus reduce the ex post selection bias associated with the current COMPUSTAT file. COMPUSTAT claims that listed firms are comprehensive with respect to industrial firms whose common stock is traded on the NYSE or AMEX, and in addition includes a set of utilities and financial firms.

For these firms, the files provide a financial statement history from 1965 to 1984. Because accounting data from 1965 to 1972 are used to estimate the

Table 1

Selection of firms for analysis.

Year	Firms with at least one data item on COMPUSTAT Annual or Research file			Firms rejected due to missing model descriptors			Total firms available for predictions			Firms not on CRSP files	Firms not listed on CRSP at month 1[a]	Firms in trading strategy	Firms with returns on CRSP files at April 1 of following year[b]
	Annual	Research	Total	Annual	Research	Total	Annual	Research	Total				
1973	1855	1042	2897	707	338	1045	1148	704	1852	50	170	1632	2687
1974	1946	993	2939	768	301	1069	1178	692	1870	49	172	1649	2641
1975	1961	934	2895	732	235	967	1229	699	1928	47	178	1703	2542
1976	1976	872	2848	715	206	921	1261	666	1927	41	171	1715	2562
1977	2005	777	2782	705	189	894	1300	588	1888	35	183	1670	2488
1978	2050	670	2720	715	171	886	1335	499	1834	31	178	1625	2423
1979	2101	561	2662	735	151	886	1366	410	1776	27	144	1605	2356
1980	2149	480	2629	777	147	924	1372	333	1705	25	98	1582	2340
1981	2190	372	2562	798	118	916	1392	254	1646	24	71	1551	2329
1982	2248	276	2524	831	96	927	1417	180	1597	24	51	1522	2276
1983	2317	183	2500	881	63	944	1436	120	1556	22	31	1503	2292
Total	22798	7160	29958	8364	2015	10379	14434	5145	19579	375	1447	17757	26936

[a] Month 1 is the first month in which firms are held in investment strategies. It is three months after the end of the fiscal year for which descriptors were reported.

[b] CRSP is the Center for Research in Security Prices at the University of Chicago.

earnings prediction model[5] and because portfolios are held for two years after financial statement dates (and 1985 CRSP returns files were used), investment strategies are implemented based on financial statement information for fiscal years 1973 to 1983. The number of observations with financial statement information in each of these years is indicated in the first 'Total' column in table 1. These numbers are greater than the number of observations with returns on CRSP files at (approximately) the financial statement date, indicated in the column to the extreme right of the table. The difference presumably represents firms included in the COMPUSTAT files but not traded on the NYSE or AMEX.

Our design calls for a comprehensive set of financial statement variables as descriptors in the earnings prediction model. Including all possible variables in such a model places too much of a demand on the data, however. If a model is estimated with a large set of descriptors from pooled data, firm observations will be lost in prediction out of sample if merely one accounting item is missing or not available for a firm.

For this reason, we reduce the number of descriptors in our estimation to a parsimonious set that captures the information in the complete set of descriptors, as described later. Despite the attempt to reduce the set of financial statement descriptors to a parsimonious set, firms are rejected in obtaining out-of-sample estimates of *Pr* if one or more of the descriptors in this set is missing or if a descriptor is one which is measuring an activity in which the firm is not involved. This reduces the set of firms for which the summary measure can be calculated to that indicated in the last 'Total' column in table 1. This amount, less firms without returns on CRSP files at the date that investment positions are taken, is the number of observations used in the trading strategies based on $\hat{Pr}$, as indicated in table 1.

The elimination of observations because of missing descriptors is the price of demanding a comprehensive financial statement analysis and using a general prediction model based on pooled data. It should be noted that this introduces ex post bias only if descriptors are available for eliminated firms but COMPUSTAT does not report them. It does, however, reduce the generality of the results to firms with operating characteristics summarized by the model. The industry composition of the final sample is similar to that on the COMPUSTAT files with the exception that there are very few electric and gas utilities (SIC code 49) and banks, financial, and real estate companies (SIC codes 60-69). These firms typically do not have the attributes identified by the prediction models.

[5]We extended this history back to 1961 by using data on firms listed on the 1980–1982 COMPUSTAT annual files. Because of the requirement to estimate an earnings drift parameter over four years, this significantly enlarged the number of observations. Note, however, that the earnings prediction model was estimated using data from 1965 on. The 1961–1964 data was used only to estimate drift parameters.

4. The execution

4.1. Calculation of the summary value measure, $\hat{Pr}$

The predictive ability of financial statement attributes is assessed using annual report data over the period 1965–1972 and again over the period 1973–1977.[6] Table 2 lists the 68 descriptors investigated. In the first stage, each descriptor was included as the sole explanatory variable in a LOGIT earnings prediction model. To estimate the parameters of the models, observations are pooled across firms and across time. Thus every paired observation of each accounting descriptor and directional future earnings change (less estimated drift) that is available in the data is included, excluding any possible selection bias. Firms are not excluded because of 'missing model descriptors' at this stage.

The coefficient estimates for all 68 accounting descriptors are given in table 2 along with a χ_1^2 statistic (and p-value) relevant to the assessment of the estimated value relative to zero.[7] In both periods 34 (or 50%) of the coefficient estimates have p-values less than 0.10. The estimates within each estimation period are not from independent observations, however. The reader may wish to compare these estimates with his or her intuition about future earnings-generating attributes of firms. We choose to distance ourself from the data, so do not develop 'stories' that rationalize the signs of the coefficient estimates here. The consistency of the sign and significance levels of the estimated coefficients on the descriptors over the two mutually exclusive estimation periods requires emphasis, however. Of the 34 descriptors with p-values less than 0.10 in the first period, 32 have the same sign on the estimated coefficient in the second period and of these 32, only 6 did not have p-values less than 0.10. Similar consistency is observed (in the first period) for descriptors with p-values less than 0.10 in the second period. This indicates that we have captured attributes of firms that demonstrate some regularity in generating earnings and that predictive ability will hold up outside of the estimation periods.

To reduce these 68 descriptors to a parsimonious set, we follow the procedures. In a second stage we include in a multivariate model all descriptors for which coefficient estimates significant at the 0.10 level are observed in the univariate estimations. We then drop all variables for which coefficient estimates in this multivariate estimation are not significant at the 0.10 level, leaving 19 variables for the 1965–1972 period and 18 for the 1973–1977

[6] The first period is longer than the second because of the need to calculate an earnings drift term over four years preceding the relevant earnings prediction year and because the 1984 COMPUSTAT files used have data only from 1965 onwards. On this issue, see footnote 5.

[7] The Logist procedure in the Statistical Analysis System (SAS) was used in all LOGIT model estimations.

Table 2

Univariate LOGIT estimation results for all accounting descriptors selected.

Descriptor number	Accounting descriptor[a]	1965–1972 estimation N^b	$\hat{\theta}^c$	χ_1^2	p-value	1973–1977 estimation N^b	$\hat{\theta}^c$	χ_1^2	p-value
1	Current ratio	14683	0.0029	0.34	0.562	12679	−0.0009	0.98	0.323
2	%Δ in 1	14607	0.0037	0.01	0.921	12362	−0.0701	3.14	0.077
3	Quick ratio	14683	0.0019	0.14	0.710	12679	−0.0009	1.02	0.312
4	%Δ in 3	13376	0.0823	5.67	0.017	11828	0.1500	17.12	0.000
5	Days sales in accs. receivable	15632	0.0001	0.01	0.925	13712	−0.0001	0.60	0.438
6	%Δ in 5	13306	−0.0647	2.33	0.127	11732	−0.0090	0.31	0.581
7	Inventory turnover	12809	0.0024	0.08	0.775	11100	−0.0023	5.47	0.019
8	%Δ in 7	12708	0.1074	4.11	0.043	11032	0.4917	40.62	0.000
9	Inventory/total assets	15604	−0.0091	0.01	0.924	13724	−0.2181	4.93	0.026
10	%Δ in 9	12836	−0.0410	2.85	0.049	11116	−0.4151	48.08	0.000
11	%Δ in inventory	12843	−0.0691	9.73	0.002	11116	−0.4521	91.94	0.000
12	%Δ in sales	15594	−0.1134	11.81	0.001	13704	−0.2816	19.91	0.000
13	%Δ in depreciation	14598	−0.0999	10.02	0.002	12530	−0.2108	16.34	0.000
14	Δ in dividend per share	15840	−2.7033	176.91	0.000	13732	−1.5693	118.58	0.000
15	Depreciation/plant assets	15540	1.4788	38.55	0.000	13445	0.8490	13.44	0.000
16	%Δ in 15	14536	0.3553	34.31	0.000	12515	0.2636	16.36	0.000
17	Return on opening equity	15529	−2.9291	32.10	0.000	13607	−2.9960	389.99	0.000
18	Δ in 17	15477	−0.0362	0.91	0.341	13522	−0.3660	19.86	0.000
19	%Δ in (capital expenditure/ total assets)	13378	−0.0193	5.55	0.018	12466	−0.0531	10.71	0.001
20	19, one-year lag	12661	−0.0169	3.98	0.046	12396	−0.0631	16.17	0.000
21	Debt–equity ratio	15559	0.0145	13.86	0.000	13340	0.0296	28.28	0.000
22	%Δ in 21	15443	0.0514	6.79	0.009	13294	0.1029	6.27	0.012
23	LT debt to equity	15559	0.0400	9.72	0.002	13607	0.0004	0.03	0.861
24	%Δ in 23	13205	−0.0025	1.17	0.279	12407	0.0046	1.23	0.268
25	Equity to fixed assets	15540	−0.0013	0.95	0.329	13445	0.0003	0.50	0.481
26	%Δ in 25	15421	−0.0072	1.29	0.255	13342	−0.0269	1.83	0.176
27	Times interest earned	15023	−0.0001	0.86	0.350	12557	0.0003	1.85	0.174
28	%Δ in 27	11904	−0.0001	0.17	0.676	10891	0.0006	1.87	0.172
29	Sales/total assets	15604	−0.0241	2.15	0.142	13724	−0.0444	6.88	0.001
30	%Δ in 29	15527	0.1593	6.80	0.009	13704	0.1383	3.52	0.069
31	Return on total assets	15604	−6.4210	342.53	0.000	13724	−6.7617	361.45	0.000
32	Return on closing equity	15559	−4.0550	366.11	0.000	13607	−0.9786	60.87	0.000
33	Gross margin ratio	15833	−0.2577	20.77	0.000	13731	−0.0889	2.28	0.131
34	%Δ in 33	13388	0.0027	0.02	0.886	11936	0.0017	0.31	0.576

35	Op. profit (before dep.) to sales	15632	−0.9918	75.33	0.000	13712	−1.2560	108.82	0.000
36	%Δ in 35	15582	−0.0001	0.06	0.804	13688	−0.0000	0.40	0.343
37	Pretax income to sales	15632	−1.9240	162.73	0.000	13712	−1.6467	504.70	0.000
38	%Δ in 37	15578	−0.0001	0.02	0.860	13692	−0.0054	5.72	0.017
39	Net profit margin	15632	−2.3731	124.39	0.000	13712	−1.7202	475.99	0.000
40	%Δ in 39	15580	−0.0075	0.01	0.891	13692	0.0005	0.02	0.880
41	Sales to total cash	14296	0.0001	0.15	0.698	12886	−0.0002	4.42	0.035
42	Sales to accs. receivable	13402	−0.0011	2.54	0.108	11745	0.0003	1.21	0.271
43	Sales to inventory	12890	0.0008	2.21	0.137	11144	−0.0009	2.42	0.120
44	%Δ in 43	12799	0.1426	11.16	0.001	11091	0.4519	48.85	0.000
45	Sales to working capital	14687	−0.0001	0.01	0.925	12709	0.0003	0.21	0.648
46	%Δ in 45	14581	−0.0005	0.34	0.562	12357	−0.0016	1.26	0.261
47	Sales to fixed assets	15540	0.0001	0.00	0.980	13445	−0.0008	0.07	0.794
48	%Δ in production	12702	−0.1058	13.43	0.000	11022	−0.0380	3.07	0.080
49	%Δ in R&D	2338	−0.1762	5.11	0.024	5283	−0.0133	1.08	0.298
50	%Δ in (R&D/sales)	2337	−0.1017	1.82	0.177	5277	−0.0076	0.37	0.540
51	%Δ in advertising expense	657	0.0596	0.11	0.739	5699	0.0012	0.14	0.709
52	%Δ in (advertising/sales)	657	0.3493	2.56	0.109	5690	0.0038	0.42	0.517
53	%Δ in total assets	15552	−0.4691	69.77	0.000	13714	−1.1751	149.28	0.000
54	Cash flow to total debt	15592	−0.2258	32.75	0.000	13716	−0.0538	6.03	0.014
55	Working capital/total assets	15604	0.0850	1.16	0.282	13724	−0.1720	5.17	0.023
56	%Δ in 55	14464	0.0010	0.73	0.394	12707	−0.0006	0.01	0.932
57	Operating income/total assests	15604	−2.4455	182.86	0.000	13724	−2.8025	214.54	0.000
58	%Δ in 57	14198	0.0017	0.13	0.717	12272	−0.0023	0.07	0.795
59	%Δ in total uses of funds	2057	−0.0686	4.39	0.038	11817	−0.0077	0.79	0.374
60	%Δ in total sources of funds	2006	−0.0533	6.66	0.010	11621	−0.0028	1.02	0.313
61	Repayment of LT debt as % of total LT debt	13301	0.8894	70.47	0.000	12556	0.0405	2.90	0.089
62	Issuance of LT debt as % of total LT debt	12176	0.0391	5.06	0.025	9689	−0.0033	0.44	0.509
63	Purchase of treasury stock as % of stock	15840	−1.5440	39.15	0.000	13370	−0.0000	0.08	0.775
64	%Δ in funds	2052	−0.0035	2.26	0.133	11809	0.0003	0.54	0.464
65	%Δ in LT debt	13301	−0.0047	2.22	0.132	12556	−0.0039	0.59	0.444
66	Cash dividend as % of cash flows	15838	1.7335	158.05	0.000	13732	−0.0011	0.00	0.957
67	%Δ in working capital	14668	0.0002	0.09	0.769	12707	−0.0002	0.08	0.780
68	Net income over cash flows	15835	−0.0073	1.15	0.284	13732	−0.0019	0.04	0.847

[a] Δ indicates changes. In calculating %Δ, observations with zero denominators are excluded and absolute values are used in all denominators.
[b] N is the number of observations in the estimations.
[c] $\hat{\theta}$ is the maximum likelihood estimate of the coefficient on the accounting descriptor.

period. In a third and final stage we investigate each of the remaining variables step-wise, deleting descriptors not significant at the 0.10 level with all other descriptors included. In this stage, 3 descriptors are dropped in the 1965–1972 period, but none in the 1973–1977 period. It is of course more desirable to proceed step-wise with the original 68 descriptors, but this calls for elimination of any firm without the full set of descriptors.

The final models (with 16 descriptors in the first estimation period and 18 in the second) are summarized in table 3. The various test statistics indicate significant ability of the descriptors to jointly describe subsequent earnings changes. At first glance there does not appear to be much consistency in the descriptors included in the models for the two periods. Of the 28 descriptors in either period, only 6 appear in both models. However, these are multivariate models and the inclusion of a particular variable and the sign on its estimated coefficient will depend on variables already in the model at the relevant step in the step-wise procedure. Notice that many of the descriptors capture similar operating characteristics. For example, inventories, sales, and deflated earnings appear in more than one descriptor. For the years 1973–1983 (the years for which investment positions are taken), we estimated $\hat{Pr}$ with both models and for each of these years estimated the correlation between the two values. The mean for the eleven years is 0.62. For a classification of $\hat{Pr}$ values above 0.5 and below 0.5, the two models classify firms consistently 78.7% of the time during these years. This indicates that the two models are capturing a similar phenomenon.

For each fiscal year 1973 to 1983, the summary value measure, $\hat{Pr}$, is calculated from financial statements for each firm with the set of model descriptors in table 3 available. For years 1973 to 1977, parameter estimates from the 1965–1972 estimations are used and for 1978 to 1983, estimates from 1973–1977 are used. The performance of the summary measure in predicting realized earnings changes is summarized in table 4. $\hat{Pr}$ values of 0.5 and 0.6 (chosen, somewhat arbitrarily, prior to the data analysis) are used alternatively as cutoffs for a predicted earnings increase with $(1 - \hat{Pr})$ being the cutoff for a predicted decrease. The x_1^2 values from a 2×2 contingency table are highly significant and the predictions appear to be correct about 60% of the time for a $\hat{Pr}$ cutoff of (0.5, 0.5) and 66% of the time for a (0.6, 0.4) cutoff. These results are similar over all years in the sample period.

4.2. *Prediction of stock returns*

Table 4 demonstrates that financial statement descriptors predict the sign of future earnings changes. Thus, if earnings are valued by investors, this financial statement analysis captures value-relevant information. However, the point is to assess whether it captures information that is not reflected in prices. If prices do not reflect the information in the descriptors about future earnings

Table 3

Summary of multivariate LOGIT earnings prediction models.

		1965–1972 estimation		1973–1977 estimation	
		No. of obs.	11322	No. of obs.	11776
		Model χ^2_{16}	908.43	Model χ^2_{18}	855.97
		p-value	0.000	p-value	0.000
Accounting descriptor selected		Likelihood ratio index[b]	0.28	Likelihood ratio index[b]	0.25
		% concordant pairs[c]	69.9%	% concordant pairs[c]	65.4%
		Rank correlation[c]	0.42	Rank correlation[c]	0.33
Descriptor number	Accounting descriptor	$\hat{\theta}^d$	χ^2_1 (p-value)	$\hat{\theta}^d$	χ^2_1 (p-value)
2	%Δ in current ratio			−1.2105	69.14 (0.00)
4[a]	%Δ in quick ratio			0.8185	53.13 (0.000)
8	%Δ in inventory turnover	0.1663	2.72 (0.100)		
9	Inventory/total assets			−1.0777	35.21 (0.000)
10	%Δ in 9	−0.1231	3.45 (0.063)	−0.7526	36.30 (0.000)
11	%Δ in inventory			0.2945	18.65 (0.000)
12	%Δ in sales			0.4846	21.77 (0.000)
13	%Δ in depreciation	−0.5107	40.61 (0.000)		
14	Δ in dividend per share	−3.0754	129.68 (0.000)	−1.5189	72.14 (0.000)
16	%Δ in (depreciation/ plant assets)	0.5613	23.39 (0.000)		
17[a]	Return on opening equity			−1.9197	44.84 (0.000)
18	Δ in 17			0.4124	10.13 (0.002)
19	%Δ in (capital expenditures/ total assets)	−0.0659	9.92 (0.002)		
20	19, one-year lag	−0.0758	16.10 (0.000)	−0.0288	4.32 (0.038)
21[a]	Debt–equity ratio			−0.0334	6.84 (0.009)
22	%Δ in 21	0.1514	7.25 (0.007)		
30	%Δ in (sales/total assets)	0.5754	13.15 (0.000)		
31	Return on total assets	−4.2089	8.62 (0.003)	−11.3727	90.95 (0.00)
32	Return on closing equity	−3.0088	28.97 (0.000)		
33	Gross margin ratio	0.8152	23.64 (0.00)		
38	% in (pretax income/sales)			0.0141	2.87 (0.090)
41	Sales to total cash			−0.003	3.81 (0.051)

Table 3 (continued)

	1965–1972 estimation		1973–1977 estimation	
Accounting descriptor selected	No. of obs.	11322	No. of obs.	11776
	Model χ^2_{16}	908.43	Model χ^2_{18}	855.97
	p-value	0.000	p-value	0.000
	Likelihood ratio index[b]	0.28	Likelihood ratio index[b]	0.25
	% concordant pairs[c]	69.9%	% concordant pairs[c]	65.4%
	Rank correlation[c]	0.42	Rank correlation[c]	0.33

Descriptor number	Accounting descriptor	$\hat{\theta}^d$	χ^2_1 (p-value)	$\hat{\theta}^d$	χ^2_1 (p-value)
					(0.051)
53	%Δ in total assets			−0.9628	37.19 (0.000)
54	Cash flow to debt	0.3282	3.47 (0.062)		
55	Working capital/ total assets			0.9571	28.39 (0.000)
57	Operating income/ total assets	−0.2726	4.10 (0.43)	3.5859	43.76 (0.000)
61	Repayment of LT debt as % of total LT debt	0.5079	24.35 (0.000)	0.0576	3.87 (0.49)
66	Cash dividend/cash flows	2.4112	159.01 (0.000)		
Intercept		0.5162	95.57 (0.000)	0.7416	104.28 (0.000)

[a] This descriptor was dropped during the stepwise procedure in the 1965–1972 estimations.

[b] The likelihood ratio index is a measure of the goodness-of-fit of the model. It is defined as 1 − (log likelihood at convergence/log likelihood with all parameters equal to zero).

[c] For matched pairs of estimated probability of an earnings increase ($\hat{Pr}$) and directional realized earnings changes. Under the null hypothesis, % of concordant pairs is 50% and rank correlation is zero.

[d] $\hat{\theta}$ is the maximum-likelihood estimate of the coefficient on the accounting descriptor.

Table 4

Summary of prediction performance of earnings prediction models; earnings changes are predicted one year ahead on the basis of $\hat{Pr}$.[a]

	Predictions over 1973–1977		Predictions over 1978–1983	
	$\hat{Pr}$ cutoff		$\hat{Pr}$ cutoff	
	(0.5, 0.5)	(0.6, 0.4)	(0.5, 0.5)	(0.6, 0.4)
Number of observations[b]	9138	5791	9640	4779
% correct predictions	62%	67%	60%	67%
χ^2_1 from 2 × 2 table (and p-value)	299.94 (0.000)	271.63 (0.000)	387.46 (0.000)	444.54 (0.000)
% predicted e.p.s. increases correct	62%	67%	59%	66%
% predicted e.p.s. decreases correct	61%	66%	62%	67%

[a] $\hat{Pr}$ is the estimated probability of an earnings increase indicated by the prediction models summarized in table 3.

[b] The total number of observations over the two periods (18778) is less than 'Total firms available for predictions' in table 1 (19579) because some firms did not survive the year for which earnings were predicted.

and if prices gravitate later towards fundamentals (as the predicted earnings become known), then the descriptors should predict stock returns. Investment strategies designed to capture these predicted returns were implemented according to the following preset program:

(i) For each of the eleven years from 1973 to 1983, stocks are assigned to investment positions at the end of the third month after the end of the fiscal year for which the accounting descriptors (from which $\hat{Pr}$ was calculated) were reported. It is assumed that annual report information was publicly available at this time.
(ii) Stocks are assigned to a 'long' position if $\hat{Pr}$ is greater than 0.6 and to short position if $\hat{Pr}$ is less than or equal to 0.4. We refer to this as the $\hat{Pr}$ strategy. With concern for the power of the test, values of $\hat{Pr}$ between these cutoff points are ignored because it is felt that values in the vicinity of 0.5 probably don't indicate the direction of earnings changes very well. Again, these cutoff points are chosen in the design stage prior to the analysis.
(iii) Stocks are held for a period of 24 months and mean return differences to the long and short positions at month 24 observed.

Cumulative returns to positions are reported at various points over the 24-month holding period. For each month, m, in the 24-month period a mean monthly return for all N_m stocks in the position in that month is calculated and added to the accumulation of such means at the end of the previous month. This yields a cumulative return, CR_m, from the first month ($\tau = 1$) to month m, as follows.

$$CR_m = \sum_{\tau=1}^{m} \sum_{i=1}^{N_m} \frac{1}{N_m} R_{im\tau}, \tag{2}$$

where R_{im} is the rate-of-return for stock i in month m. This calculation results in the cumulative return of those stocks that stopped trading during the 24 months to be carried forward in the cumulative return for subsequent months. Thus the cumulative return at any point contains the total observed returns for all firms initially in the position.[8] However, the calculation involves monthly rebalancing of portfolios. Buy-and-hold returns are also calculated by compounding up returns for individual stocks each month and then averaging

[8]Cumulative returns were also calculated by multiplying one plus the cumulative mean return at the end of the previous month by one plus the mean return for the month (and subtracting one), with very similar results.

across firms in the portfolio, as follows:

$$BHR_m = \frac{1}{N_m} \sum_{i=1}^{N_m} \left[\prod_{\tau=1}^{m} (1 + R_{im\tau}) - 1 \right]. \tag{3}$$

Buy-and-hold portfolios do not require monthly rebalancing and thus involve lower transactions costs. On these issues, see Blume and Stambaugh (1983) and Roll (1983). However, buy-and-hold returns at the end of the holding period (month 24) contain only the cumulative return experience of firms still trading at that time. One might calculate cumulative returns with the proceeds of the sale of stocks that stopped trading reinvested in the strategy. However, this assumes that these stocks can be liquidated, which may not be the case for some trading halts. Such reinvestment will, of course, involve the rebalancing of portfolios.

In the tables that follow, we report returns based on the calculation in (2) and report buy-and-hold returns in (3) in the text. Two sets of investment returns are reported. The first summarizes all observations in the sample and provides the basis for a comparison with the Ball and Brown strategy. Because firms have different fiscal year ends (and thus, for a given calendar year, the execution date differs over firms), the return for each firm/month in each position is defined as the firm's observed return for the month minus that for an equally weighted market return index for the month calculated from CRSP NYSE and AMEX monthly return indexes. Return to the position for the relevant month of the holding period (in event time) is calculated as the difference in mean returns for all such months for all stocks in the long and short sides of the position. The weights on securities are determined ex post here so it is not an implementable strategy.

The second set of returns reflects the result of an investment strategy that could have been executed at the time and so is appropriate for assessing market efficiency. Positions are taken on the basis of $\hat{P}r$ values at each April 1 following each of the eleven years from 1973 to 1983 in December fiscal-year stocks only. For each month in the position, the return to the hedge position is again the difference between mean returns for the long and short sides of the position. Thus the same amount of money is invested in the long and short position for zero net investment, ignoring transaction costs. Reported returns for each month in the holding period are means of returns to the strategy over the eleven years (rather than means over stocks) and thus reflect the average profitability for the strategy implemented each year. Holding period months coincide in calendar time so the market return and other common factors drop out in the calculation of returns to the zero-investment hedge position if both sides of the position have the same sensitivity to these common factors.

Before presenting the results for positions based on values of $\hat{P}r$, we present, in table 5, results from positions based on perfect foreknowledge of

Table 5

Mean cumulative market-adjusted monthly returns from hypothetical investment in stocks on the basis of the direction of one-year-ahead earnings changes;[a] 1973–1983.

Earnings change portfolio	N	Month of holding period 3	6	9	12	18	24	36[e]
		Panel A: All firms[b]						
(Δ e.p.s. − drift) > 0	9207	0.0373	0.0655	0.0975	0.1159	0.1267	0.1371	0.1614
(Δ e.p.s. − drift) ≤ 0	7790	−0.0363	−0.0761	−0.1075	−0.1166	−0.1190	−0.1096	−0.0882
Hedge portfolio[c]	16997	0.0736	0.1416	0.2050	0.2325	0.2458	0.2467 (0.000)[d]	0.2496
		Panel B: Firms with $\hat{Pr} > 0.6$ or $\hat{Pr} \leq 0.4$						
(Δ e.p.s. − drift) > 0	5748	0.0311	0.0567	0.0858	0.1092	0.1196	0.1353	0.1790
(Δ e.p.s. − drift) ≤ 0	3774	−0.0390	−0.0841	−0.1180	−0.1282	−0.1362	−0.1292	−0.1051
Hedge portfolio[c]	9522	0.0702	0.1408	0.2038	0.2373	0.2558	0.2645 (0.000)[d]	0.2841

[a]Portfolio formation date is three months after end of the year prior to the earnings change year.

[b]All firms with returns over the holding period and one-year-ahead earnings.

[c]Long positions are taken in stocks with (Δ e.p.s. − drift) > 0 and short positions in stock with (Δ e.p.s. − drift) ≤ 0.

[d]Relative frequency of observing the 24-month return, or greater, in a random strategy repeated 2,000 times.

[e]Based on ten years, 1973–1982.

the realized values of subsequent years' earnings changes (minus the drift estimate) for all observations in the sample. Positions are taken at the same time as those for $\hat{Pr}$ (and prior to any earnings reports for the period predicted) and held for the same period of time. Long positions are taken in stocks with earnings increases and short positions in stocks with earnings decreases. This is the Ball and Brown (1968) hypothetical strategy. The results in panel A of table 5 (which are consistent over all years) demonstrate that earnings, one period ahead, are relevant for determining firms' relative values. Further, it is clear from the correspondence of signs on earnings changes and realized stock returns that (future) earnings are a positive-value attribute. Thus we feel comfortable in basing our summary value measure on the ability of financial statement descriptors to predict these earnings. Indeed, we propose to use the returns to this perfect-foresight (PF) strategy as a benchmark against which to compare the returns from the $\hat{Pr}$ strategy which reflects a (less than perfect) earnings prediction. The returns to the perfect foresight (PF) strategy for firms in the $\hat{Pr}$ strategy are given in panel B of table 5 for later reference.

Table 6 gives the results from the $\hat{Pr}$ strategy. The bottom of the table supplies mean cumulative market-adjusted returns from the hedge position at various months in the holding period, for all stocks and for the implementable positions in December 31 fiscal-year stocks. Although not part of our preset program, we also report mean cumulative market-adjusted returns on stocks with $\hat{Pr}$ values within the ten ranges indicated and mean cumulative market-adjusted returns on all portfolios 36 months after execution for a sensitivity analysis. However, our statistical inferences are restricted to the 24-month return on the hedge positions as determined by our preset program.[9] For these we give (in parentheses) the relative frequency of observing the reported return or greater in a strategy of assigning stocks to long and short sides of the position at random in 2,000 replications. In these replications, the number of randomly selected stocks assigned to each side of the position in each year is the same as the number of stocks in the corresponding side of the position in the $\hat{Pr}$ strategy for that year. The observed relative frequency is 0.000 in both cases. The 24-month return to the hedge position for all stocks (0.1453) is 55% of the 24-month return of 0.2645 to the perfect foresight (PF) strategy for firms with $\hat{Pr} > 0.6$ or $\hat{Pr} \leq 0.4$ which is given in panel B of table 5. The $\hat{Pr}$ partitioning variable does very well relative to not only a random strategy, but also to the Ball and Brown benchmark based on foreknowledge of the actual earnings realizations. The results for December 31 fiscal-year stocks indicate that a 24-month return of 0.1256 on average could have been earned during the sample period with zero net investment, and it is unlikely that this could have occurred by chance.[10] The mean cumulative 24-month return to the hedge position for December 31 fiscal-year firms using buy-and-hold calculations is 0.1684. As pointed out above, this return measures the return for stocks still trading at month 24.

The cumulative return to the $\hat{Pr}$ strategy is not diminished up to month 36. Further, it appears that the cumulative returns at this point vary almost monotonically in the predicted direction over levels of $\hat{Pr}$ in much the same way as percentage of earnings changes predicted correctly (in the fourth column) increase as $\hat{Pr}$ varies from 0.5. The ability of $\hat{Pr}$ to sort both subsequent stock returns and subsequent earnings changes appears to capture the realignment of prices to the fundamentals. It also could indicate persistent risk differences over $\hat{Pr}$ groups. Note that, whereas cumulative returns to the PF strategy in table 5 do not increase much after month 12 (when the actual earnings are public), those for the $\hat{Pr}$ strategy do so, indicating the prediction model (together with the $\hat{Pr}$ cutoff points of 0.6 and 0.4) may be capturing

[9] The zero net investment position applies only to the first month as price changes thereafter may result in investment on the long side not being equal to the amount in the short position. Note that the 'returns' to the hedge portfolio are not strictly returns as zero investment is involved. These figures should be interpreted as the sum of returns to each side of the position.

[10] As a 24-month investment position is taken every year, these results involve simultaneously running two portfolios, except in the first and last year. The mean return for positions taken in odd calendar years is 0.1139, while that taken in even calendar years is 0.1396. These involve returns that are not overlapping in calendar time.

Table 6

Mean cumulative market-adjusted monthly returns from investment in stocks on the basis of estimated probability of an earnings increase ($\hat{P}r$);[a] 1973–1983.

$\hat{P}r$ portfolio	$\hat{P}r$ values	N	% correct predictions ($\hat{p}r = 0.5$ cutoff)	Month of holding period 3	6	9	12	18	24	36[b]
1	$\hat{P}r > 0.9$	658	85.2	−0.0029	0.0085	0.0118	0.0548	0.0443	0.0633	0.1864
2	$0.9 \geq \hat{P}r > 0.8$	928	75.5	0.0015	0.0021	−0.0201	−0.0031	−0.0129	0.0058	0.0931
3	$0.8 \geq \hat{P}r > 0.7$	2174	67.8	0.0184	0.0228	0.0346	0.0525	0.0576	0.0787	0.1008
4	$0.7 \geq \hat{P}r > 0.6$	4359	59.2	0.0109	0.0124	0.0295	0.0384	0.0545	0.0719	0.1045
5	$0.6 \geq \hat{P}r > 0.5$	4802	47.4	0.0086	0.0134	0.0188	0.0221	0.0330	0.0444	0.0560
6	$0.5 \geq \hat{P}r > 0.4$	3007	60.4	0.0057	−0.0007	0.0034	0.0003	0.0000	−0.0013	−0.0083
7	$0.4 \geq \hat{P}r > 0.3$	1174	68.5	−0.0124	−0.0242	−0.0293	−0.0379	−0.0557	−0.0629	−0.0804
8	$0.3 \geq \hat{P}r > 0.2$	417	73.9	−0.0105	−0.0247	−0.0430	−0.0625	−0.1072	−0.1098	−0.1171
9	$0.2 \geq \hat{P}r > 0.1$	154	72.7	−0.0000	0.0085	−0.0182	−0.0241	−0.0246	−0.0552	−0.1468
10	$\hat{P}r \leq 0.1$	84	66.7	−0.0084	−0.0399	−0.0991	−0.1109	−0.1604	−0.2185	−0.1881
Hedge portfolio, all stocks[c]		9948	66.3	0.0214	0.0356	0.0577	0.0834	0.1152	0.1453 (0.000)[e]	0.2083
Hedge portfolio, 12/31 stocks[d]		5631	66.4	0.0093	0.0175	0.0302	0.0741	0.1001	0.1256 (0.000)[e]	0.1963

[a] Portfolios are formed three months after the fiscal year for which the accounting descriptors (on which $\hat{P}r$ is based) were reported.

[b] Based on ten years, 1973–1982.

[c] Long positions are taken in all stocks with $\hat{P}r > 0.6$ and short positions in all stocks with $\hat{P}r < 0.4$, with zero net investment. Reported returns are mean differences for the holding month between mean cumulative returns of the two sides of the positions.

[d] Involves firms with December 31 fiscal-year ends only. Reported returns are means over years of returns to positions taken at April 1 of each year with long positions in stocks, with $\hat{P}r > 0.6$ and short positions in stocks with $\hat{P}r \leq 0.4$, with zero net investment.

[e] Relative frequency of observing the 24-month return, or greater, in a random strategy repeated 2,000 times.

value attributes beyond one-year-ahead earnings. Indeed, we have found that $\hat{Pr}$ predicts the direction of earnings changes three years ahead on average [see Ou and Penman (1989)]. Note further that the perceived realignment of prices to fundamentals appears to be complete by month 36: the cumulative return to the $\hat{Pr}$ strategy from investing in stocks at the end of month 36 and holding them for 24 months (not reported in the table) is only 0.0191 (based on years 1973–1980 for which returns data are available).

The cumulative returns for the $\hat{Pr}$ groups in table 6 indicate that our choice of $\hat{Pr}$ values of 0.6 and 0.4 as cutoff points for assignment of stocks to long and short positions is conservative. The return could be improved by investing in more extreme $\hat{Pr}$ stocks. With fewer stocks in extreme $\hat{Pr}$ groups, it is likely that the variance of return to positions in these stocks would be higher, however.

Panel A of fig. 1 displays the mean cumulative market-adjusted returns to the hedge position in all stocks for each year from 1973 to 1983 and, to the extreme right, the mean over all years. These returns are positive in all years except 1983. A very similar picture emerges for December 31 fiscal-year stocks. This consistency assures us that the result in table 6 is not due to a fews years. Panel B of fig. 1 gives the cumulative market-adjusted returns to the long and short positions for each year (the difference of which is equal to the returns in the top panel). The returns are in the direction indicated by the position, except in 1982 and 1983. There are considerably more stocks in the long position than in the short position in all years. Over all years the short position contributes more to the total hedge portfolio return than the long side, with the mean return to the short position over years being -0.0799 and to the long position 0.0672. However, this is largely due to the (contrary) large negative return on the long side for 1983.

Three caveats must be given in interpreting the reported returns as returns to an implementable strategy. First, the returns are gross of transactions costs. The inability to use the proceeds from the short positions means that the strategy must be financed. Thus, in practice, it is not a zero net investment strategy. Second, any subsequent returns to stocks that stopped trading during the 24-month holding period are not included here (although returns up to the point of the trading halt are). This is the case with bankrupt firms that return a bankruptcy dividend. Of the December 31 fiscal-year firms in the position in the first month, 7.2% had dropped out by month 24, with 6.8% of firms in the long position dropping out and 8.5% on the short side. Unfortunately, CRSP does not give a code indicating whether firms went bankrupt, although they do indicate other reasons why stocks stopped trading.[11] On the long side of the position, 1.2% dropped out for reasons other than merger or exchange and

[11]CRSP gives six codes indicating the reason a stock stopped trading: merger, exchange, liquidation, delisting by exchange, trading halted by exchange, and suspended by SEC.

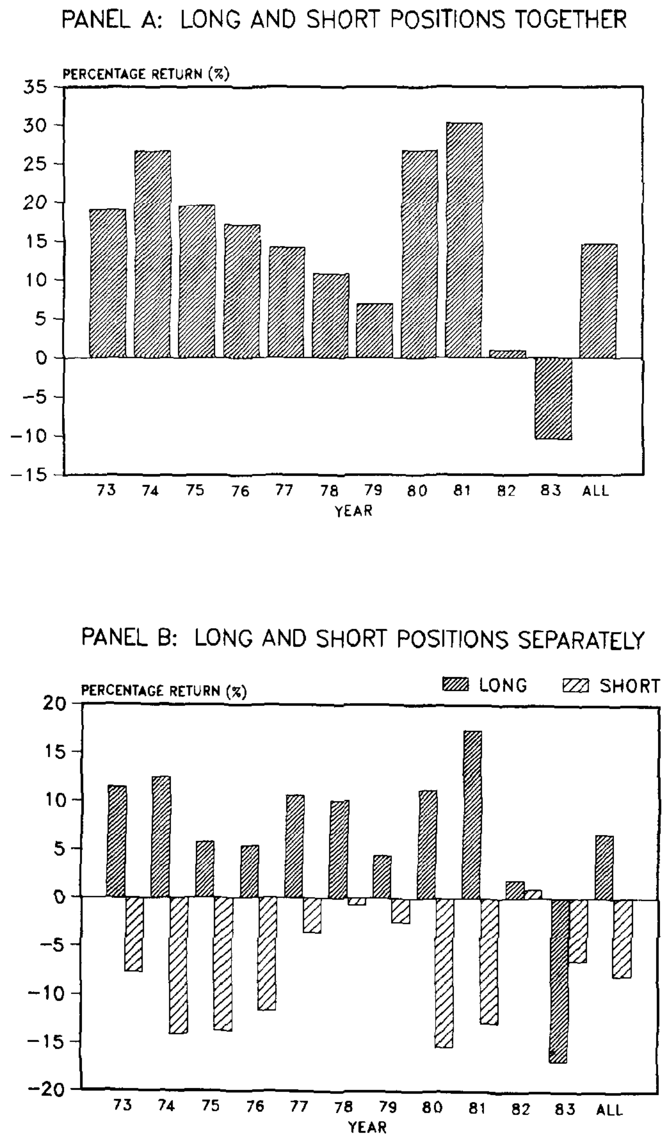

Fig. 1. Mean cumulative market-adjusted returns over 24 months to hedge positions based on the estimated probability of an earnings increase ($\hat{Pr}$), by year. Long positions are taken in stocks with $\hat{Pr} > 0.6$ and short positions are taken in stocks with $\hat{Pr} \leq 0.4$.

1.9% on the short side. These figures suggest that the omission of subsequent returns affects both sides of the position to a similar degree. In any case, this is not a problem if the last price before the trading halt is an unbiased predictor of the subsequent payoff. The third caveat concerns our assumption that the annual reports on which $\hat{Pr}$ is based are available at the date on which positions were taken, three months after fiscal-year end. An inspection of table 6 indicates that the returns to the strategy are not particularly sensitive to taking positions some months after this date.

5. The $\hat{Pr}$ summary measure and risk

These results demonstrate the ability of the value measure to predict stock returns in the sample period. It is possible that, despite our precautionary design, $\hat{Pr}$ is distinguishing firms on risk characteristics rather than delayed price adjustments to value fundamentals. If so, observed differences in realized returns across $\hat{Pr}$ portfolios may be differential rewards to differential risk. The approach has been to extract a value measure from financial statements that is correlated with positive-value attributes (namely, future earnings) and (hopefully) has low correlation with risk attributes. However, the latter is not guaranteed. This section investigates the risk explanation. We do so with the disclaimer that, as there is no generally universally accepted definition of risk, we can never be sure that we are comparing returns against the appropriate benchmark. We entertain as benchmarks the returns associated with a number of attributes that have been advocated as risk proxies.

5.1. A correlation profile

Table 7 summarizes, by $\hat{Pr}$ portfolio, values of certain characteristics that have been proposed as risk attributes, along with other attributes which may identify $\hat{Pr}$ as a positive-value descriptor rather than a risk descriptor. The values for the hedge position in this table are mean differences over years in the mean values over both sides of the position with all stocks included. t-values, based on the time series of mean differences over years, are given in parentheses.

The second column of table 7 demonstrates that $\hat{Pr}$ discriminates on the magnitude of subsequent percentage changes in earnings-per-share, the predicted attribute as well as the sign. Thus returns for different $\hat{Pr}$ levels in table 6 capture differential subsequent earnings performance. Note further that $\hat{Pr}$ is negatively related to percentage changes in earnings in the current year, the year for which the financial statement descriptors were reported. Thus these descriptors identify not only the direction of future earnings changes but also that of current earnings: high values of $\hat{Pr}$ indicate cases where current earnings are 'temporarily depressed' and low values of $\hat{Pr}$ identify cases where current earnings are 'abnormally high' (relative to the past and future). More

Table 7

Summary of selected attributes of $\hat{Pr}$ portfolios; 1973–1983.

$\hat{Pr}$ portfolio	Relative % e.p.s. changes in prediction year[ah]	Relative % e.p.s. changes in current year[ah]	Mean cumulative market-adjusted return over prior 24 months	Mean beta estimated over prior 60 months[b]	Mean beta estimated during holding period[b]	Mean std. dev. of returns over prior 60 months[b]	Mean std. dev. of returns over holding period[b]	Relative E/P ratios[a]	Relative equity market value (in $m)[a]	Relative market leverage[af]	Relative book leverage[ag]	Relative market/book ratios[a]
1	81.3	−168.4	−0.4238	1.18	1.29	0.1300	0.1430	−0.330[d]	−56.10	0.188	0.116	−0.283
2	49.5	−74.3	−0.2925	1.10	1.21	0.1173	0.1197	−0.139[e]	−51.38	0.144	0.053	−0.309
3	31.8	−28.0	−0.1287	1.06	1.11	0.1109	0.1120	−0.048	−39.37	0.095	0.021	−0.243
4	3.1	−5.4	−0.0158	1.05	1.05	0.1155	0.0998	−0.005	−19.35	0.032	0.002	−0.144
5	−3.4	2.5	0.0700	1.02	1.01	0.1017	0.0928	0.017	14.76	−0.019	−0.009	0.034
6	−5.6	7.8	0.1445	1.01	1.00	0.1025	0.0912	0.023	66.50	−0.072	−0.021	0.264
7	−11.5	15.8	0.2709	1.03	1.01	0.1064	0.0904	0.020	118.67	−0.111	−0.016	0.541
8	−20.8	23.1	0.3502	1.09	1.03	0.1203	0.0956	0.038	97.18	−0.086	0.010	0.576
9	−17.8	45.8	0.5240	1.12	1.31	0.1290	0.1133	0.055	16.64	−0.019	0.058	0.695
10	−10.9	66.3	0.3668	1.17	1.12	0.1314	0.1098	0.042	55.18	−0.026	0.061	0.644
Hedge portfolio, all stocks[c]	26.1	−35.3	−0.4243	0.01	0.06	−0.0022	0.0137	−0.064	−132.07	0.170	0.025	−0.763
	(6.23)	(−4.98)	(−7.99)	(0.39)	(1.83)	(−0.64)	(4.63)	(−6.74)	(−3.35)	(5.88)	(1.99)	(−5.86)

[a] Values are means (over eleven years) of differences (in each eleven years) in portfolio median values from median value for all firms in the year.

[b] Means calculated over portfolio means for eleven years.

[c] Figures given are mean differences in values for long and short sides of the $\hat{Pr}$ hedge portfolio (described in note c to table 6). Figures in parentheses are t-statistics on mean differences over eleven years.

[d] Median E/P ratios are negative for all years except 1978.

[e] Median E/P ratios are negative in years 1978–1983.

[f] Market leverage defined as book value of debt/ (market value of equity plus book value of debt). Market values are calculated from prices and shares outstanding at portfolio formation date, or, if these were unavailable, prices and shares outstanding at fiscal-year end.

[g] Book leverage defined as book value of debt/ (book value of equity plus book value of debt).

[h] % e.p.s. changes are defined as change in e.p.s. divided by absolute value of prior year's e.p.s.

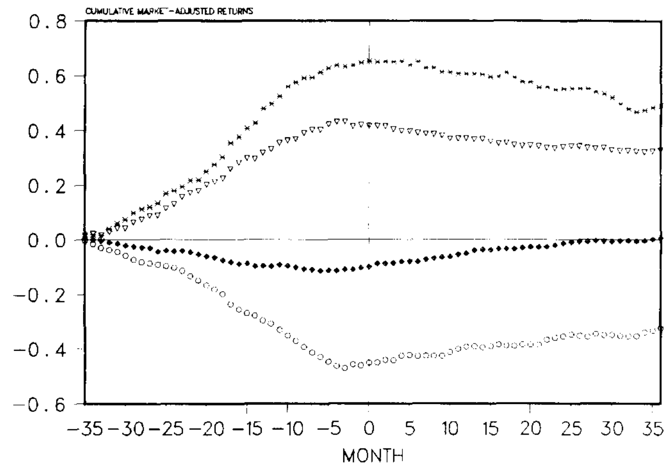

Fig. 2. Mean cummulative market-adjusted returns from 35 months prior to $\hat{Pr}$ portfolio formation month, month 0, to 36 months after $\hat{Pr}$ portfolio formation month, for selected $\hat{Pr}$ portfolios, 1973–1982; ○ $\hat{Pr} > 0.8$, ⊕ $0.6 < \hat{Pr} \leq 0.8$, ▽ $0.2 < \hat{Pr} \leq 0.4$, ✳ $\hat{Pr} \leq 0.2$.

significantly, the table indicates that $\hat{Pr}$ is also negatively related to cumulative (market-adjusted) returns over the previous 24 months up to the portfolio formation date [while being positively related to cumulative (market-adjusted) returns over the subsequent 24 months, as described in table 6]. For extreme $\hat{Pr}$ portfolios the prior returns are quite large. Thus $\hat{Pr}$ identifies price reversals as well as earnings turning points: high values of $\hat{Pr}$ are associated with prior price declines followed by price increases and low values of $\hat{Pr}$ are associated with prior price increases followed by price declines. Fig. 2 graphically depicts these reversals for stocks with $\hat{Pr} > 0.8$, stocks with $0.6 < \hat{Pr} \leq 0.8$, stocks with $0.2 < \hat{Pr} \leq 0.4$, and stocks with $\hat{Pr} \leq 0.2$ in a window covering 72 months around $\hat{Pr}$ portfolio formation dates, month 0. This phenomenon supports the interpretation that $\hat{Pr}$ identifies cases where stock prices have previously 'moved away from fundamentals' as well as subsequent reversion to fundamentals.

These price reversals are inconsistent with $\hat{Pr}$ capturing risk characteristics that are stationary over the periods before and after the observation of the $\hat{Pr}$ values. However, the prior price changes could reflect risk *changes* that are associated with changing premiums in the future. Fama and French (1988) provide this explanation for similar price swings observed in their work. As returns both prior to and subsequent to month zero are market-adjusted, this explanation demands that $\hat{Pr}$ measures substantially reorder firms' risks relative to the market portfolio (the average firm) at the relevant financial statement date. This seems a little implausible. Table 7 gives mean betas for $\hat{Pr}$

groups estimated prior to and subsequent to the date when investment positions were taken. Higher estimated betas are associated with both extremes of the $\hat{Pr}$ distribution. Further, there is no indication of reversal in ordering of mean betas before and after the $\hat{Pr}$ observation dates that would explain the reversals in market-adjusted returns in fig. 2.

Mean betas for all stocks in table 7 cancel over the two sides of the hedge portfolio. For the hedge portfolio with December 31 fiscal-year firms, a hedge portfolio beta can be estimated. This is close to zero. As the holding period was 24 months after each portfolio-formation date, estimations were performed twice (on portfolio monthly returns using OLS techniques), first for portfolios formed in odd-numbered calendar years and second for portfolios formed in even-numbered years. For the first estimation, estimated hedge portfolio beta was 0.029 (with a t-statistic of 1.04) and for the second estimation, 0.074 (with a t-statistic of 2.02). These estimates are not independent.

Like estimated betas, higher standard deviations of returns are associated with both extremes of $\hat{Pr}$ in table 7. The figures reported in the standard deviation columns for the hedge portfolio in table 7 are the mean differences in the standard deviation of returns between the two sides of the hedge position for all stocks. These compare the variance characteristics of all stocks with $\hat{Pr} > 0.6$ and $\hat{Pr} \leq 0.4$. For the December 31 fiscal-year hedge portfolio, the standard deviations of portfolio monthly returns for each side of the hedge portfolio over the holding period are in the order of 0.06 (very close to that for the equally weighted market index). For this portfolio a standard deviation of returns for the portfolio can be calculated because returns are aligned in calendar time. This is only about 0.02. Further, the estimated correlation between returns on each side of the hedge position is about 0.93.[12] This high correlation indicates that both sides in the position have similar sensitivities to common (risk) factors affecting returns. These cancel in the hedge position resulting in the significant reduction in standard deviation of return for the position.

These investigations indicate that the predicted returns cannot be explained by return-based risk measures. Note further that there is no strong association of $\hat{Pr}$ values with industry groups (whose risks may differ) over the entire sample period. The rest of table 7 summarizes other attributes that have been conjectured as risk measures and which may indicate risk that is not captured by estimated beta or return standard deviation. These are all observed at the same time as $\hat{Pr}$. Referring to these measures as risk attributes is problematical, for with the exception of book leverage, they include market price. If

[12] For the set of returns from positions in odd-numbered years, the standard deviation of returns for the equally-weighted market index, the long side of the position, the short side of position, and the hedge portfolio were 0.0628, 0.0630, 0.0621, and 0.0203, respectively. For the second set of returns, the corresponding figures were 0.0559, 0.0598, 0.0574, and 0.0224.

market price reflects mispricing with respect to $\hat{Pr}$, one cannot disentangle this mispricing from risk.[13]

E/P ratios are negatively related to $\hat{Pr}$. If E/P ratios are risk proxies as has been suggested in Ball (1978), for example, the direction of the association is inconsistent with $\hat{Pr}$ capturing this aspect of risk. $\hat{Pr}$ is not capturing 'P/E effects'. Rather, the direction of the correlation can be explained by the fact that E/P ratios are negatively related to future earnings growth [Beaver and Morse (1978)]. Like $\hat{Pr}$, E/P ratios are expressing an earnings prediction.[14] The remaining attributes in table 7 – market value of equity (size), market and book leverage, and market-to-book premiums – are all correlated with $\hat{Pr}$ in a direction which indicates that if they are risk proxies, $\hat{Pr}$ may be capturing risk differences across firms. Clearly more controls are necessary before inferences about fundamentals predicting risk-adjusted returns can be entertained.

5.2. Further controls

Table 7 indicates that $\hat{Pr}$ is related to firm size, with the direction of the association suggesting that table 7 results capture a 'size effect'. Empirical work on security prices done in the last ten years indicates that size explains cross-sectional differences in mean returns, suggesting that it is a risk proxy. Table 8 provides results from the same investment positions as those in table 6, but with returns adjusted for size effects.[15] For each month in the position, the return for each firm was calculated as the observed return minus the mean return for that calendar month on a size control portfolio in which the firm was a member. Firms were assigned to one of ten size control portfolios (with the same number of securities) in each of the eleven years based on a ranking of firms in the sample at that time on market value of equity.

We carry out this size adjustment with some reservation. The rationale is that size proxies for risk. However, it could also indicate market inefficiency. In particular, if some small firms in our sample have low market values because of previous price declines which represent 'deviations from fundamentals' (with a similar argument for large firms), we may be taking out some of the mispricing of stocks as well as risk-related return. Indeed, table 7 indicated

[13] For example, book values (for given current earnings) predict future earnings [Freeman, Ohlson and Penman (1982)]. Thus the negative correlation between $\hat{Pr}$ and market-to-book is consistent with the market's mispricing of predicted earnings as well as with market-to-book ratios capturing risk. With respect to market leverage, firms that have projects that they see as particularly profitable may finance them through debt rather than equity if they perceive equity to be undervalued. Thus market leverage can be construed as a signal of future profitability and of mispricing of equity.

[14] The similarity of $\hat{Pr}$ and E/P as earnings predictors is explored in Ou and Penman (1989).

[15] The number of stocks in the position here is slightly less than in table 6 because price and shares outstanding data could not be discovered for a few firms.

Table 8

Mean cumulative size-adjusted monthly returns from investment in stocks on the basis of estimated probability of an earnings increase ($\hat{Pr}$);[a] 1973–1983.

$\hat{Pr}$ portfolio	$\hat{Pr}$ values	N	Month of holding period 3	6	9	12	18	24	36[b]
1	$\hat{Pr} > 0.9$	658	−0.0162	−0.0149	−0.0216	0.0036	−0.0200	−0.0241	0.0286
2	$0.9 \geq \hat{Pr} > 0.8$	928	−0.0094	−0.0165	−0.0453	−0.0419	−0.0681	−0.0656	−0.0330
3	$0.8 \geq \hat{Pr} > 0.7$	2174	0.0071	0.0069	0.0097	0.0225	0.0168	0.0267	0.0219
4	$0.7 \geq \hat{Pr} > 0.6$	4358	0.0017	−0.0013	0.0056	0.0149	0.0209	0.0295	0.0372
5	$0.6 \geq \hat{Pr} > 0.5$	4800	0.0045	0.0054	0.0019	0.0068	0.0107	0.0150	0.0100
6	$0.5 \geq \hat{Pr} > 0.4$	3005	0.0047	−0.0053	−0.0072	−0.0064	−0.0092	−0.0112	−0.0251
7	$0.4 \geq \hat{Pr} > 0.3$	1159	−0.0099	−0.0248	−0.0369	−0.0362	−0.0519	−0.0565	−0.0713
8	$0.3 \geq \hat{Pr} > 0.2$	417	−0.0010	−0.0282	−0.0554	−0.0630	−0.1116	−0.1045	−0.1083
9	$0.2 \geq \hat{Pr} > 0.1$	154	−0.0013	0.0033	−0.0332	−0.0322	−0.0405	−0.0643	−0.1651
10	$\hat{Pr} \leq 0.1$	84	−0.0110	−0.0451	−0.1079	−0.1291	−0.1797	−0.2474	−0.2165
Hedge portfolio, all stocks[c]		9932	0.0098	0.0220	0.0424	0.0554	0.0763	0.0908 (0.000)[e]	0.1185
Hedge portfolio, 12/31 stocks[d]		5631	−0.0009	0.0068	0.0244	0.0458	0.0654	0.0702 (0.000)[e]	0.1052

[a] See note a to table 6.
[b] Based on ten years, 1973–1982.
[c] See note c to table 6.
[d] See note d to table 6.
[e] Relative frequency of observing the 24-month return, or greater, in a random strategy repeated 2000 times.

that high $\hat{Pr}$ values associated with small firms are also associated with prior price declines, while low $\hat{Pr}$ values associated with large firms are also associated with prior price increases.

In spite of this, the hedge portfolios' size-adjusted returns at month 24 in table 8, though about 40% less than the market-adjusted returns in table 6, are significant, as indicated by the test statistic in parentheses under the returns.[16] The 24-month return to the hedge strategy for all firms is 35% of the 24-month size-adjusted return of 0.2582 to the PF strategy in stocks with $\hat{Pr} > 0.6$ or $\hat{Pr} \leq 0.4$. The relative frequency of observing this return, or greater, in 2,000 replications with randomly selected stocks was 0.000. This is so for positions in stocks with December 31 fiscal-year ends also.[17] Mean buy-and-hold size-adjusted returns for this position at month 24 are 0.0736.

Fig. 3 depicts the 24-month size-adjusted returns to the $\hat{Pr}$ hedge strategy in all firms for each year from 1973 to 1983. Panel A gives the overall returns and panel B the returns to the long and short sides separately. It is evident that the strategy, net of returns to size, did not perform well in 1979, 1982, and 1983, with negative outcomes in 1979 and 1983. As the accuracy of $\hat{Pr}$ in predicting directional earnings in these years was not inferior to that in other years for any of the $\hat{Pr}$ groups, we decided to dig further to discover the reason for this inconsistency. The results for 1979, 1982, and 1983, as for other years, are not due to a few monthly return outliers. The holding periods for these years were not periods of prolonged bear markets so the exceptions cannot be attributed to the earnings prediction model capturing risk attributes related to market factors. For 1982 and 1983 (but not 1979) there is an aspect of the data that in part explains the results. The results for these years are largely attributable to negative return performance on the long side of the hedge position. 31.4% of the 1702 firms reporting current losses in the sample fell in these years (these were bad years for corporate profits) with 95.5% of these in portfolios 1–4. In fact, 35.2% of all stocks in these portfolios in 1982 and 1983 had current losses, compared to 17.7% over years 1973–1981. These loss firms performed well in earnings prediction tests. However, in partitioning returns on perfect-foresight realized earnings changes in the year predicted, the 210 loss firms in 1982 with positive subsequent earnings changes were associated with a mean 24-month size-adjusted return of -0.0296 and the 193 loss firms in 1983 with positive subsequent earnings changes were associated with a mean size-adjusted 24-month return of -0.2834. Hence the market valued positive earnings

[16] The observed return may still reflect some size effect if there is significant residual variation in size within the ten size portfolios and if $\hat{Pr}$ is related to size within these portfolios. Investigation discovered that this residual size effect is very small.

[17] The estimated beta for size-adjusted returns to the hedge position taken in December 31 fiscal-year stocks in odd-numbered years was -0.001 (with a t-statistic of -0.05). For positions taken in December 31 fiscal-year stocks in even-numbered years it was -0.027 (with a t-statistic of -1.21).

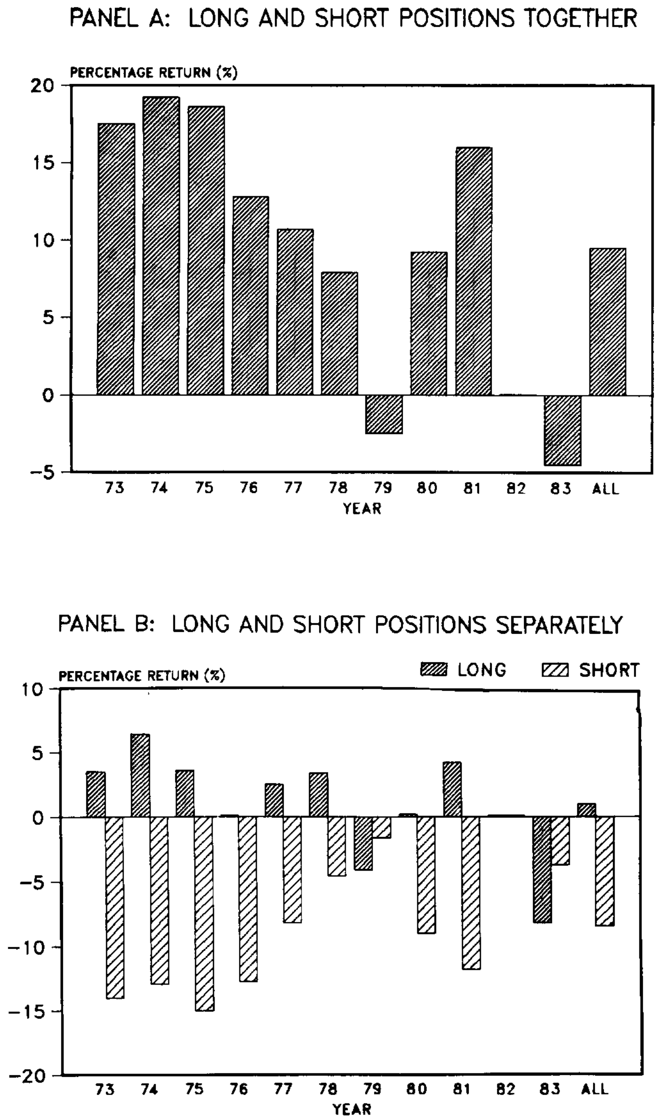

Fig. 3. Mean cumulative size-adjusted returns over 24 months to hedge positions based on the estimated probability of an earnings increase ($\hat{Pr}$), by year. Long positions are taken in stocks with $\hat{Pr} > 0.6$ and short positions are taken in stocks with $\hat{Pr} \leq 0.4$.

changes for these firms negatively. This was not the case in other years[18] or for profitable firms in 1982 and 1983. The result appears to be attributable in part to the Ball and Brown strategy not working for loss firms in these years. The size-adjusted retuns to the $\hat{Pr}$ hedge strategy in 1982 and 1983 excluding loss firms (on either side of the hedge position) were 0.0804 and 0.0855, respectively. (This calculation was not part of our preset program, of course.)

It is clear from panel B of fig. 3 that most of the size-adjusted return to the hedge position comes from the short side. The mean return to the long position over years, given at the extreme right of the figure, is 0.0105 while that for the short side is -0.0849. This, of course, is due to small-firm return premiums being subtracted from the returns to the long position. If these premiums are rewards to risk that is related to size, then our financial statement analysis is profitable primarily for sell positions. If small firms identified by high $\hat{Pr}$ in the long position are small because they are undervalued, then the difference in returns over long and short sides of the positions is merely the result of an inappropriate size adjustment that takes out the price appreciation for these firms. The price reversals (from declining prices to increasing prices relative to the market) that are evident for these firms in table 7 and fig. 2 are consistent with both changing risk that reduces market values (size) and deviations of prices from the fundamentals captured in $\hat{Pr}$ that also reduces market values.

Our fundamental analysis can be compared to the technical analysis of DeBondt and Thaler (1985, 1987). Their analysis documents price reversals associated primarily with 'loser' portfolios, that is, with stocks whose prices have previously declined. This phenomenon appears to be identified with small firms and price appreciations in January (see their 1987 paper) and, once size effects and January effects are controlled for, the phenomenon is not apparent [Zarowin (1988)]. The ability of our fundamental measure to predict returns survives after size adjustment of returns and, for size-adjusted returns, is associated primarily with 'winner' stocks (previous price increases relative to the market), not 'loser' stocks. It is not due to January effects. This is evident from the size adjustment (the January effect being a small-firm phenomenon) and by results (not reported) that are obtained when January returns are dropped in the accumulations.

A similar analysis was carried out for controls for market and book leverage and market-to-book premiums. The analysis was carried out on size-adjusted returns so the control for size was simultaneously maintained. The results indicated that the returns for the $\hat{Pr}$ strategy could not be explained by returns

[18]An exception is 1979, a negative size-adjusted performance year. Here there were only 79 loss firms with actual earnings increases in the year predicted (out of 327) with a mean 24-month return of -0.0893 to a long position based on the actual increases. This cannot, by itself, explain the 1979 result: the 24-month hedge return excluding loss companies in 1979 was -0.0055.

predicted by these attributes. Details of these tests are available in an earlier version of the paper [Ou and Penman (1987)].

5.3. The $\hat{Pr}$ announcement effect

One further test indicates that $\hat{Pr}$ is not describing risk differences across firms. The accounting items on which $\hat{Pr}$ is based are published in annual accounting reports sometime between fiscal-year end and the time at which investment positions were taken, three months after fiscal-year end. If the $\hat{Pr}$ number conveys new information, a market price reaction to this information should be observed during this three-month period. If $\hat{Pr}$ is interpreted by investors as a (positive-value) indicator of future earnings, price changes should be positively related to the (unexpected) news in $\hat{Pr}$, similar to that observed for 'unexpected earnings', because $\hat{Pr}$ news is unexpected future earnings. If investors interpret $\hat{Pr}$ instead as a risk measure, price changes should be negatively related to values of $\hat{Pr}$.

Table 9 indicates the effect of the announcement of $\hat{Pr}$ on stock returns. It summarizes, for stocks in the $\hat{Pr}$ strategy, the cumulative size-adjusted returns over these three months from investing in stocks at fiscal-year end on the basis of foreknowledge of the forthcoming $\hat{Pr}$. Because we are unsure what aspect of $\hat{Pr}$ might convey news (that is, what is 'unexpected $\hat{Pr}$'), results are given for both levels of $\hat{Pr}$ (panel A) on the assumption that deviation of $\hat{Pr}$ from 0.5 is news and changes in $\hat{Pr}$ ($\Delta\hat{Pr}$) from one annual report to the next (panel B) on the assumption that revision in $\hat{Pr}$ levels is news. Further, as $\hat{Pr}$ is negatively correlated with earnings published at the same time (table 7), results are given for earnings increases and decreases separately to control for the earnings announcement concurrent with $\hat{Pr}$. It is clear from table 9 that returns over this announcement period are positively correlated with $\hat{Pr}$ and changes in $\hat{Pr}$. Market reactions to the publication of demonstrated earnings predictors are in the direction which indicates they are evaluated indeed as positive-attribute earnings predictors and not as risk changes. The result also indicates that the market recognizes some of the information in $\hat{Pr}$ when it is published. This is the result in Ou (1989). Our observations of returns following the publication of $\hat{Pr}$ indicate that the market is slow to appreciate that information fully.

The announcement effect in table 9 is likely to be understated because we have controlled only for the direction of current earnings changes, not the magnitude. As current earnings changes are negatively correlated with $\hat{Pr}$, remaining earnings announcement effects work against the observed result. It is likely that annual earnings changes measure 'unexpected earnings' reported in the three months poorly and some components of $\hat{Pr}$ may be available prior to the annual report. These considerations reinforce the null of no announce-

Table 9

Mean cumulative size-adjusted monthly returns over three months after fiscal-year end from hypothetical investment in stocks on the basis of foreknowledge of $\hat{Pr}$; 1973–1983 (panel A), 1974–1983 (panel B).

Portfolios	Number of stocks[a]	Mean median % e.p.s. change in current year[b]	Month relative to fiscal-year end 1	2	3
		Panel A: Levels of $\hat{Pr}$			
		$(\Delta\ e.p.s. - drift) > 0$			
$\hat{Pr} > 0.6$	4001	50.0	0.0086	0.0203	0.0259
$\hat{Pr} \leq 0.4$	1211	55.4	−0.0046	−0.0046	−0.0069
Hedge portfolio[c]	5212	−5.4	0.0132	0.0250	0.0328
		(−0.53)[d]			(3.79)[d]
		$(\Delta\ e.p.s. - drift) \leq 0$			
$\hat{Pr} > 0.6$	4122	−50.3	0.0023	−0.0049	−0.0081
$\hat{Pr} \leq 0.4$	608	−0.1	−0.0126	−0.0148	−0.0196
Hedge portfolio[c]	4730	−50.3	0.0149	0.0100	0.0115
		(−6.56)[d]			(0.22)[d]
		Panel B: Changes in $\hat{Pr}$ ($\Delta \hat{Pr}$)			
		$(\Delta\ e.p.s. - drift) > 0$			
$\Delta \hat{Pr} > 0$	1400	35.0	0.0133	0.0262	0.0350
$\Delta \hat{Pr} \leq 0$	2841	64.3	0.0047	0.0128	0.0149
Hedge portfolio[c]	4241	−29.2	0.0086	0.0134	0.0201
		(−3.85)[d]			(2.97)[d]
		$(\Delta\ e.p.s. - drift) \leq 0$			
$\Delta \hat{Pr} > 0$	3467	−59.7	0.0014	−0.0054	−0.0081
$\Delta \hat{Pr} \leq 0$	781	−20.9	−0.0084	−0.0146	−0.0171
Hedge portfolio[c]	4248	−38.7	0.0098	0.0093	0.0090
		(−7.82)[d]			(0.65)[d]

[a] For panel B only stocks for which consecutive values of $\hat{Pr}$ were observed (from 1974–1983) are involved.
[b] Mean of median %e.p.s. changes observed over the sample period.
[c] Long positions are taken in stocks satisfying the first condition and short positions in stocks satisfying the second condition.
[d] t-statistic calculated from the time series of observations to the position over the sample period.

ment effect, however, not the observed result. In any case, the result is similar when returns are observed over the twelve months during which the four quarterly and annual earnings reports that contain both the annual earnings change and $\hat{Pr}$ are published [see Ou (1989)].

Table 7 indicated that high $\hat{Pr}$ values are associated with large negative current earnings changes and low $\hat{Pr}$ values with large positive current earnings changes. One might conjecture, then, that the returns to the $\hat{Pr}$

strategy might be predicted by current earnings changes without the other financial statement information involved in the calculation of $\hat{P}r$. A number of papers have documented that 'post-earnings-drifts' in returns are predicted by extreme earnings changes [for example, Foster, Olsen, and Shevlin (1984) and Bernard and Thomas (1989)] and extreme earnings relative to price [Basu (1983)]. In Ou and Penman (1989) we show that return drifts predicted by E/P ratios (which are positively correlated with earnings changes) are in fact negatively correlated with returns to positions based on $\hat{P}r$. This is indeed suggested by the negative correlation between $\hat{P}r$ and current earnings changes and E/P ratios that is evident in table 7. Thus, $\hat{P}r$ is not predicting 'post-earnings-drifts' in returns. Note, however, that Ball, Kothari, and Watts (1988), in their investigation of 'post-earnings-drifts' in stock returns, find that extreme positive earnings changes (the top 10% in cross-section) are followed by negative returns after their unique beta-risk adjustment. This is in the opposite direction to 'post-earnings-drifts' documented in other studies. These extreme positive earnings changes are likely to be associated with $\hat{P}r$ values less than 0.4 (table 7) and so are in the same direction as those indicated by $\hat{P}r$. For both sides of the $\hat{P}r$ position, we partitioned firms into those with contemporaneous earnings increases and contemporaneous earnings decreases and calculated the mean 24-month cumulative market-adjusted returns from three months after fiscal-year end for each group. For firms with $\hat{P}r \leq 0.4$, the mean 24-month return following the 1220 cases with earnings increases was -0.0820 and for the 609 cases with earnings decreases it was -0.0764, little different. Likewise, for firms with $\hat{P}r > 0.6$, the mean 24-month return following the 4012 cases with earnings increases was 0.0784, and for the 4107 cases with earnings decreases it was 0.0525. Thus the returns to $\hat{P}r$ positions cannot be replicated by positions based on contemporaneous earnings changes.[19]

6. Conclusion

On the basis of an extensive financial statement analysis we have derived a summary measure from financial statements that predicts future stock returns. Although we cannot be absolutely sure that this measure is not solely a risk attribute, the analysis indicates that this is not so. It appears that this fundamental measure captures equity values that are not reflected in stock prices.

We feel reasonably confident in our conclusion because of the conservative approach to the data. We followed a fixed, preset program of investing in stocks which may not be optimal. We derived the value measure based on observed correlations with one-year-ahead earnings and ignored earnings for years further in the future. The model estimated to predict these earnings did

[19]Similar inferences are drawn from size-adjusted returns.

not exploit all aspects of the data. It was based on a dichotomous specification of future earnings rather than on actual dollar amounts and was not re-estimated every year in the sample period. Further, it was based on a pooling of all firms and one suspects that industry-specific or firm-specific models would produce improvements, provided enough data were available to estimate coefficients with precision.

The evidence here suggests that financial statements capture fundamentals that are not reflected in prices. Thus, it points to limitations in the traditional approach in empirical analysis in accounting of making inferences about accounting numbers on the basis of contemporaneous associations with prices. Much of that research stems from the work of Ball and Brown (1968). The findings here indicate that the predictive associations between earnings predictors and future stock returns capture a good deal of the contemporaneous association between earnings and stock returns documented in the Ball and Brown paper.

In closing, it should be noted that there is one aspect of fundamental analysis that has not been incorporated in our program. Fundamental analysis extracts value measures from financial statements and compares them to prices to identify mispriced stocks. Our trading strategies involve cross-sectional comparisons of the value measure, $\hat{Pr}$, rather than comparisons with prices. It is quite possible that, given market inefficiency, some high (low) values of $\hat{Pr}$ are associated with overpricing (underpricing). In taking investment positions one would want to distinguish such cases from those where the mispricing was in the direction implied by the long and short positions taken here. Unfortunately, direct comparison of $\hat{Pr}$ to prices is difficult because it is not in dollar-per-share form. However, Ou and Penman (1989) indicate that the return to the $\hat{Pr}$ strategy is improved if one restricts investment in the long position to stocks with $\hat{Pr} > 0.6$ and price low relative to earnings in cross-section and the short position to stocks with $\hat{Pr} \leq 0.4$ and price high relative to earnings in cross-section.

References

Ball, R., 1978, Anomalies in relationships between securities' yields and yield-surrogates, Journal of Financial Economics, June-Sept., 103–106.

Ball, R. and P. Brown, 1968, An empirical evaluation of accounting income numbers, Journal of Accounting Research, Autumn, 159–178.

Ball, R., S.P. Kothari, and R.L. Watts, 1988, The economics of the relation between earnings changes and stock returns, Manuscript (William E. Simon Graduate School of Business Administration, University of Rochester, Rochester, NY).

Basu, S., 1983, The relationship between earnings yield, market value and the return for NYSE stocks: Further evidence, Journal of Financial Economics, June, 129–156.

Beaver, W., P. Kettler, and M. Scholes, 1970, The association between market determined and accounting determined risk measures, Accounting Review, Oct., 654–682.

Beaver, W.H. and D. Morse, 1978, What determines price–earnings ratios?, Financial Analysts' Journal, July–Aug., 65–76.

Bernard, V.L. and J.K. Thomas, 1989, Post-earnings announcement drift: Delayed price response or risk premium?, Journal of Accounting Research, forthcoming.
Blume, M.E. and R.F. Stambaugh, 1983, Biases in computed returns: An application to the size effect, Journal of Financial Economics, Oct., 387–404.
DeBondt, W.F.M. and R.H. Thaler, 1985, Does the stock market overreact?, Journal of Finance, July, 793–805.
DeBondt, W.F.M. and R.H. Thaler, 1987, Further evidence of investor overreaction and stock market seasonality, Journal of Finance, July, 557–581.
Fama, E.F. and K.R. French, 1988, Permanent and temporary components of stock prices, Journal of Political Economy, April, 246–273.
Foster, G., C. Olsen, and T. Shevlin, 1984, Earnings releases, anomalies, and the behavior of security returns, Accounting Review, Oct., 574–603.
Freeman, R.N., J.A. Ohlson, and S.H. Penman, 1982, Book rate-of-return and prediction of earnings changes: An empirical investigation, Journal of Accounting Research, Autumn, 639–653.
Garman, M.B. and J.A. Ohlson, 1980, Information and the sequential valuation of assets in arbitrage-free economics, Journal of Accounting Research, Autumn, 420–440.
Graham, B., D.L. Dodd, and S. Cottle, 1962, Security analysis: Principles and techniques, 4th ed. (McGraw-Hill, New York, NY).
McKibben, W., 1972, Econometric forecasting of common stock investment returns: A new methodology using fundamental operating data, Journal of Finance, May, 371–380.
Miller, M. and F. Modigliani, 1961, Dividend policy, growth and the valuation of shares, Journal of Business, Oct., 411–433.
Ohlson, J.A., 1988, A synthesis of security valuation theory and the role of dividends, cash flows, and earnings, Manuscript (Graduate School of Business, Columbia University, New York, NY).
Oppenheimer, H.R., 1981, Common stock selection: An analysis of Benjamin Graham's 'intelligent investor' approach (YMI Research Press, Ann Arbor, MI).
Ou, J.A., 1989, The incremental information content of non-earnings accounting numbers as earnings predictors, Manuscript (Leavey School of Business Administration, Santa Clara University, Santa Clara, CA).
Ou, J.A. and S.H. Penman, 1987, Financial statement analysis and the prediction of stock returns, Manuscript (University of California, Berkeley, CA).
Ou, J.A. and S.H. Penman, 1989, Accounting measurement, *P/E* ratios and the information content of security prices, Journal of Accounting Research, forthcoming.
Roll, R., 1983, On computing mean returns and the small firm premium, Journal of Financial Economics, Oct., 371–386.
Rosenberg, B. and V. Marathe, 1975, The prediction of investment risk: Systematic and residual risk, in: Proceedings of the seminar on the analysis of security prices, Nov. (Center for Research in Security Prices, University of Chicago, Chicago, IL) 185–226.
Rubinstein, M., 1976, The valuation of uncertain income streams and the pricing of options, Bell Journal of Economics, Autumn, 407–425.
Zarowin, P., 1988, Size, seasonality and stock market overreaction, Manuscript (New York University, New York, NY).