THE IMPACT OF RECESSION ON THE VALUE-RELEVANCE OF ACCOUNTING RATIOS

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This research investigates the effects of economic recession on financial ratio analysis. Recession may alter or create new investment risk factors that play an important role in the determination of expected returns. To the extent that financial ratios proxy for such factors, ratio analysis may be affected by recession. In this report the results of an empirical investigation support this assertion. Systematic differences are detected in the direction, significance, and strength of associations of financial ratios with stock returns during periods of economic recession.

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INTRODUCTION

Numerous studies have documented that financial ratios (e.g., return on assets, earnings to price, assets turnover, and so forth) are value-relevant, i.e., associated with stock returns.[1] The value-relevance of accounting ratios, however, appears to vary markedly across time.[2] Additionally, in studies that use identical model selection procedures (e.g., STEPWISE sequential selection procedures), markedly different models are typically derived across different time periods.[3]

Ou and Penman [1989] and Holthausen and Larcker [1992] document that ratios can be used in trading rule strategies to earn subsequent abnormal returns. The trading rules developed by Ou and Penman and Holthausen and Larcker, however, produce substantively larger average abnormal returns during years when business activity is declining, i.e., economic recession.[4] Lev and Thiagarajan [1993] specifically examine contextual changes in return associations. They show that different levels of business activity affect the association of certain accounting-based "fundamental signals" with risk-adjusted returns. Similarly, Johnson [1992] detects shifts in earnings response coefficients across the business cycle.

Recession is thus implicated by previous research as a source of time-variation in the value-relevance of accounting ratios. This study specifically addresses this question by examining whether accounting ratios' association with stock returns vary during the occurrence of recession. The results of this study provide evidence that the value-relevance of many financial ratios are sensitive to the occurrence of recession. In particular, this study documents evidence of systematic differences in the direction, significance and strength of associations of accounting ratios with stock returns across the business cycle. Ratios are shown to be acutely sensitive to recession.

II. BACKGROUND

Some empirical research has studied whether intertemporal risk factors truly exist. In particular, the effects of the business cycle have been studied. Gooding and O'Malley [1977], Krueger and Johnson, [1990] and Wiggens [1992], by employing conditioning approaches and business cycle definitions of "up" and "down" markets, all found evidence that estimates of the market model beta, a proxy for systematic risk, shift across the business cycle.[5]

In unconditioned models, accounting ratios are known to be associated with risk factors that drive expected return.[6] A number of arguments suggest that intertemporal risk factors associated with recession may also be detectable by accounting ratios. First, the return associations of several liquidity measures, including the current ratio and the quick ratio, should be impacted by the business cycle. Intuitively, relatively greater liquidity, because it mitigates default risk, should be positively associated with subsequent returns during recession-associated market valuation events.

Second, several variables that are affected by strategic management strategies might be impacted by the business cycle. Management strategies aimed at volume growth may vary in effectiveness over the business cycle. Firms that are pursuing growth in volume and capacity require exogenous opportunities to sell goods and services. Because demands for goods and services decline during recession, a firm following such a strategy should experience relatively lower ex-post return performance during a recession. High pre-recession rates of change in leverage, inventory, depreciation, capital investment, and research and development would all proxy for a volume growth strategy. In addition, the proportionate amount of depreciation over plant assets, to the extent that capital investment aimed at volume and capacity expansion has a faster or more volumous average write-off rate,

also will proxy for a growth-oriented management strategy.

Growth proxies, such as change in sales and total assets, might also be contiguous indicators of a volume growth strategy. Firms with intractable growth-strategies in place would, on average, be expected to experience, immediately prior to a recession, relatively high rates of change in sales and total assets. On the other hand, summary income numbers would not necessarily reflect growth of volume and capacity. In growing firms, current margins may temporarily remain flat as competitive pricing policies are employed to increase market share and, by spreading fixed costs over larger unit volume, increase future profits and margins.

The "strategy mis-match" effect just described would not reverse immediately with the expectation of expansion. Prior to the onset of the early stages of expansion, many firms should have excess plant capacity resultant from the current recession. This excess may preclude firms from initiating new growth strategies pending evidence that expected increased demand will reach persistent levels that exceed the firm's current unused capacity.[7]

Third, inventory-based ratios may act as a proxy for commodity price exposure of firms around business cycle peaks, implying increased sensitivity to the effects of impending recession. Fama and French [1988] document inversions in commodity spot metals pricing that occur around business cycle peaks. If inventory levels are at least partly inelastic, inventory measures should proxy for firms' exposure to spot metal prices and, therefore, be sensitive to beta shifts occurring as the result of business cycle-related changes in the commodity pricing markets. Because spot prices fall after the onset of recession, high levels of inventory act to reduce a firm's opportunity to exploit better input pricing. Inventory measures should, therefore, be negatively associated with subsequent stock returns measured from the onset of a recession-associated market valuation event.

Fourth, market strategists have long identified certain "defensive stocks" with high dividend yields whose cash flows are less affected by the occurrence of recession. Firms with more stable cash flows in more mature industries should be willing to payout more cash flow from operations and retain less to buffet against future shocks induced by recession. Therefore, dividend ratios, such as dividends over total assets, should be positively associated with returns measured during recession.

Finally, several of the profitability measures also conceivably could exhibit business cycle sensitivity. These include operating profit to sales, pre-tax income to sales, and net profit margin. In each case, as a summary performance number, earnings-based ratios may reflect some aspect of corporate structure that influences performance behavior in a particular business cycle stage. For example, firms that are especially aggressive in pricing before a recession occurs might experience a greater loss of profit when a less favorable sales environment develops during recession.

The primary objective of this study is to examine whether financial ratios contain conditional information about stock returns obtained during recession. If conditional information content exists, it should be observable in partitioned data sets as follows. First, accounting ratios may be significantly associated with stock returns measured only during recessionary periods. Second, the strength of associations of accounting ratios with subsequent stock returns may be systematically greater when returns are measured during recessionary periods. Third, the signs of association of accounting ratios with subsequent stock returns may be dependent upon whether returns are measured during recessionary conditions. In this research, the associations of financial ratios with stock returns obtained during recession were examined to obtain evidence of each of these observables. For comparitive purposes, the associations of financial ratios with stock returns obtained during expansions were also examined.

I. METHODOLOGY

Ou and Penman selected for examination in their study a comprehensive set of 68 accounting ratios that had been emphasized in texts on fundamental analysis. To retain congruence with that study, and the studies that followed, including Holthausen and Larcker [1992], Greig [1992], and Stober [1992], the original 68 ratios were re-examined in this study. In addition, several other ratios were examined, either because previous research indicated they may also be useful in predicting stock returns, or because they appear to proxy for dimensions that are arguably impacted by the business cycle.[8] A total of 82 ratios were thus investigated in this study, including ratios that proxy for liquidity (cash over total assets, the current ratio, and the quick ratio), profitability (operating profit to sales, pre-tax income to sales, gross and net profit margins), management strategy (changes in inventory, sales and depreciation, changes in total assets, research and development and working capital, changes in leverage, and long term debt), dividend policy (dividend over total assets), and inventory pricing exposure (inventory over total assets), as discussed earlier. A full list of the ratios that were examined is included in Table 2. Ratio associations were examined in the context of both simple and multiple regression analysis. The simple regression tests for significance of association of ratios with stock returns proceeded as follows. To condition the regressions, data were first partitioned by event type: stock returns occurring during recession-associated valuation events; and, for purposes of comparison, stock returns occurring during expansion-associated valuation events. For each partitioned data-set, risk-adjusted returns were next regressed on each ratio. Risk-adjusted returns were used to isolate, to the extent possible, inter-temporal effects, by controlling for cross-sectional risk factors that may be driving the results. The significance of any associations was then computed, using standard t tests, and compared and contrasted. The critical t values associated with the .01 p level was chosen, ex-ante, as the basis for determination of pooled regression significance, primarily because of the large number of observations used in estimation.

For the multiple regression tests, the ratio selection procedures used to develop parsimonious models followed the procedures described in Ou and Penman [1989]. A selection filter based on the simple regression results was applied. For each partitioned data-set, using estimation data only, those ratios the simple regression coefficients of which were consistent in sign and significance at the .05 level, using unpooled partitioned data (i.e., for each recession that occurred) , were "candidate ratios" eligible for inclusion in the multiple regression model.

The candidate ratios from the first stage of the study were analyzed, using STEPWISE sequential selection procedures and recession data, for inclusion in a "best" multiple regression model.[9] In addition to testing for overall model significance of association with risk-adjusted returns, the individual coefficient values were also examined for evidence of systematic shifting across business cycle type. The strength of association was examined in the multiple regression case using adjusted R^2.

Business Cycle Events

Business cycle events were modeled as discrete occurrences. The intuition behind this can be seen in the following example. If an expansion occurs and creates growth opportunities, firms will activate endogenous processes associated with development and growth to exploit these opportunities. For example, at the individual firm level, the aggregate degree of growth potential is irrelevant so long as it exceeds the firm's capacity to supply goods and services demanded. The same intuition can be applied in recessionary environments.

A question that arises concerning business cycle events is determining when investors are able to discount the occurrence of macroeconomic recessions (and expansions). The National Bureau

of Economic Research (hereafter NBER) regularly publishes it's assessments of where business activity peaks and troughs occur. These dates have the advantage of being exogenously determined and objective. There is also ample precedence for their use.[10] Unfortunately, direct use of NBER dates would require the implied assumption that investors predict and discount business cycle events contemporaneous with their occurrence. Piccini [1980] finds that investors' expectations appear to change some months prior to changes in the business cycle.

To circumvent this issue and capture the event of interest, a heuristic was used that was designed to capture the period where investors' expectations actually shift (i.e., as with NBER's methodology, the points where bull and bear market troughs and peaks occur). The onset of recession-associated (expansion-associated) market valuation events was marked by graphically determining the high (low) points of the S&P500 stock index trends that were coincident with or immediately preceded the NBER designation.[11] This methodology is similar to the "phase" identification procedure used by Gooding and O'Malley [1977] and has the advantage of being objective because (1) it is heuristic; (2) the identification of events is conducted ex-ante; and (3) the NBER dates are exogenously determined. On the other hand, it remains arbitrary (the NBER dates themselves are) and assumes that investors are at least partly predicting and discounting the effects of impending recessions and expansions during the related major market valuation changes. The market valuation changes occurring during these business cycle-associated valuation change periods (hereafter, BVCPs), however, are typically quite large, suggesting that some major macroeconomic event is being discounted. For example, in the recession-associated BVCP that is defined as beginning January 11, 1973, using this methodology, the S&P500 stock index fell by more than 40% in just 21 months. Table 1 lists the BVCP intervals in the sample period, notation for each, boundary dates, S&P500 index levels at the boundaries, the valuation change in the S&P500 index during the BVCP, and the boundaries for measurement of the reporting data used to construct ratios for each BVCP interval indicated. BVCPs are considered similar (dissimilar) if the same (different) type of business cycle event triggered the valuation change.

Sample Selection

The sample consisted of all NYSE/AMEX firms on both the CRSP daily return file and the 1983 COMPUSTAT Annual Primary, Supplementary and Tertiary file with complete market and accounting data available during the applicable measurement intervals. These intervals occurred from 1969 to 1983. For each observation, market data were required for the year subsequent to the onset of a BVCP as marked by the BVCP beginning dates listed in Table 1.[12] Similarly, reporting data were required from the annual financial statements that immediately preceded the onset date of a BVCP. The annual report dates that were used for each BVCP are also listed in Table 1. They cover a range of time because firms were not limited to any particular reporting period (i.e. only calendar year firms, for example). Survivorship bias and sample selection bias are inherent limitations of this study. First, the requirement of full data across a BVCP inevitably caused a screening of firms that did not survive throughout the BVCP. Survivorship bias, however, should decrease the likelihood of finding that the associations of accounting data with subsequent abnormal returns are acutely sensitive to recession-associated market valuation events. In effect, the most sensitive firms, bankruptcies and general business failures, would be removed from the sample. Second, sample selection bias arises because full data for each variable in a model was required for inclusion of that observation. The sample necessarily did not represent a random sample of firms, nor was it perfectly balanced across industries. In particular, banks, utilities and service firms were not well represented. Nevertheless, this is standard

Table 1
BUSINESS-CYCLE ASSOCIATED VALUATION CHANGE PERIODS (BVCPs)

Period and Type	Begin Date	End Date	Duration (Months)	S&P500 Begin	S&P500 End	S&P Change	Ratio Measurement Interval
1 Rec	12/02/68	5/26/70	17	109.06	68.84	-36.8%	11/67-11/68
2 Exp	05/26/70	01/11/73	31	68.84	121.74	76.8%	4/69-4/70
3 Rec	01/11/73	10/04/74	22	121.74	63.23	-48.06%	12/71-12/72
4 Exp	10/04/74 03/28/80	02/13/80 11/26/80	72	63.23 94.23	120.22 141.96	140.66**	9/73-9/74
5 Rec	2/14/80 11/27/80	3/27/80 08/09/82	21	120.22 141.96	94.23 101.44	-50.10%**	1/79-1/80
6 Exp	08/10/82	06/05/90	94	101.44	368.78	263.54%	7/81-7/82

**Shows combined change for both sub-periods defined by NBER dates.

practice in studies like this one and has proven an acceptable limit.

Stock Returns

As mentioned, the choice of the best risk-adjustment procedure to use is currently ambiguous. Consistent with Ou and Penman [1989], and numerous other studies, size-adjusted abnormal returns were chosen. They were chosen for two reasons. First, Fama and French [1992] show that estimates of beta have little or no association to average returns after controlling for firm size. Second, systematic differences in the length of most BVCPs cause special problems when comparing predictive ability under a market model definition of abnormal return.[13] Market model estimates of beta are known to be degenerate across time. Intervals between prediction and estimation, therefore, must be equivalent in order to unambiguously interpret differences in predictive ability under market model specifications of abnormal return. Estimation and prediction BVCPs, however, are matched in this study with respect to BVCP type, thus producing prediction-estimation intervals that vary in length and which could confound results under a market model definition.

Size-adjusted returns are, therefore, defined as:

$$AR_{it}=R_{it}-R_{pt} \tag{11}$$

where AR_{it} is the abnormal return for firm i at time t, R_{it} is the total return for firm i at time t, and R_{pt} is the equal weighted mean return for time t on the NYSE AMEX firm size decile containing firm i at the beginning of the calendar year. Firm size is proxied by the market value of common equity plus preferred stock plus the book value of any liabilities. Consistent with previous research, the time interval for abnormal returns is the year following the onset of a BVCP.

The size-adjusted abnormal returns, hereafter SAR, for any BVCP interval, g, is therefore:

$$SAR_{i,g}=(AR_{i,g}-1/N\sum_{j=1}^{N} AR_{j,g})/\sigma_{AR,g}, \tag{12}$$

where the subscript g refers to the applicable BVCP interval, N is the number of cross-sectional firms in the sample being tested and all other terms are as previously defined. As shown in equation (12), SARs were also standardized by each BVCP sample's standard deviation, $\sigma_{AR,g}$. This, along with the size adjustment (similar to a mean adjustment), served to reduce some of the noise associated with pooling observations over both firms and time.

IV. RESULTS

Simple Regression Analysis

The simple regression results of the pooled tests are listed in Table 2. Twenty-seven of the eighty-two ratios were significantly associated, at the .01 level, to pooled recession-associated BVCP SARs. Of these, twenty-three ratios were insignificantly associated to expansion-associated BVCP SARs. The other four ratios were significant, at the .01 level, across both BVCP types but exhibited sign reversal. Five other accounting-based ratios were found to be significantly associated to subsequent expansion-associated BVCP SARs while being insignificantly associated to subsequent recession-associated BVCP SARs. Fifty ratios were not associated to any subsequent BVCP SARs.

In summary, the simple regressions for twenty-seven of the thirty-two ratios that

exhibited any significant associations with subsequent risk-adjusted returns showed evidence of information content specific to recession conditions. This rate exceeds that which would be expected by chance alone and suggests that ratios may proxy for inter temporal risk factors associated with recessionary conditions.

The specific arguments advanced earlier that implicate certain accounting ratios as surrogates for business cycle-associated inter-temporal risk factors are also supported by the results of Table 2. First, the return associations of several liquidity measures, including the current ratio, the quick ratio, and cash over total assets, appear to be impacted by the business cycle. Both are positively associated with subsequent size-adjusted returns only during recession-associated market valuation events. Second, the variables that proxy for heightened investment activity, including depreciation over plant assets and changes, respectively, in leverage, inventory, depreciation, capital investment, and research and development, all vary in significance of association across the business cycle, being significantly negatively associated with subsequent recession-associated BVCP SARs, as expected. The "strategy mis-match" effect, however, does not reverse immediately with the expectation of expansion, as most of these ratios are insignificantly associated with subsequent expansion-associated BVCP SARs.

Third, inventory over total assets is significantly associated only with subsequent recession-associated BVCP SARs. Further, the association is decidedly negative, supporting the argument that high levels of inventory act to reduce a firm's opportunity to exploit better input pricing that results from falling commodity prices as business conditions decline. Fourth, dividends over total assets is significantly associated only with recession-associated BVCP SARs and the association is strongly positive. This is consistent with the theory that liberal dividend policies act as a signal to investors that cash flows are relatively stable and less affected by changing business conditions.

Finally, three profitability measures exhibit systematic variation across the business cycle in their associations with subsequent BVCP SARs. In particular, operating profit to sales, pre-tax income to sales, and net profit margin were all significantly associated with subsequent BVCP SARs, irrespective of type, but in all of these cases, the associations systematically exhibited sign reversal across BVCP type.

The associations of accounting data also appear to be more acutely sensitive when estimated with recession-associated BVCP data. Examined but not reported in detail are the simple regressions' strengths of association, as measured by adjusted r^2. The regressions' strengths of association are generally always larger when the regressions are estimated with recession-associated BVCP data.

The Multiple Regression Analysis

Because financial ratios are often right-skewed and typically violate assumptions of normal ity imposed by multiple linear regression, a number of transforms of the 82 financial ratios were tested to improve specification in the multiple regression tests.[14] The strength of association, as measured by adjusted r^2 then used to determine which ratio transform would enter the subsequent multiple regression analysis.[15] A total of 16 (7) financial ratios qualified for inclusion in the recession-sensitive (expansion-sensitive) BVCP multiple regression model.

The stepwise sequential selection procedure produced a seven variable "recession-sensitive" model from the sixteen variables available for inclusion. The variables were as follows: change in inventory, change in depreciation, depreciation over plant assets, operating profit to sales, change in working capital, and dividends over total assets. Collinearity was checked in two ways. First, correlation matrices were examined for evidence of high bi-variate collinearity. No variable pairs for either

TABLE 2
Simple Regression Results
Pooled BVCP Data

		Recession-Associated		Expansion-Associated				Recession-Associated		Expansion-Associated	
		β_1	t	β_1	t			β_1	t	β_1	t
1	Curr ratio	.0391	5.85**	-.0054	-.72	42	Sales/ acct rec	.0001	.14	.0001	.09
2	Change in #1	.0195	.51	.1623	2.86*	43	Sales/ inv	.0000	.03	.0020	1.79
3	Quick ratio	.0517	7.05**	-.0112	-1.38	44	Change in #43	.1465	2.65*	.0660	1.91
4	Change in #3	.0679	2.18^	.1382	2.88*	45	Sales/ work cap	-.0070	-.46	-.0432	-3.22*
5	Days sales/AR	-4.743	-.53	14.082	1.59	46	Change in #45	-.0241	-.37	.1699	2.48^
6	Change in #5	.1003	2.04^	.0706	2.32^	47	Sales/ fix assets	.0000	.03	.0000	.16
7	Inv turnover	.0001	.12	.0017	1.10	48	Change in prod	-.0232	-.63	.0053	.16
8	Change in #7	.2190	3.64**	-.0038	-.05	49	Change in R&D	-.2313	-2.85*	-.0219	-.55
9	Inv/ TA	-.9060	-6.10**	-.1884	-1.35	50	Chge in RD/sales	-.1799	-1.76	-.0131	-.29
10	Change in #9	-.0609	-1.94	.0033	.08	51	Change in adv	-.1313	-.78	-.0231	-.72
11	Change in inv	-.0592	-3.53**	-.0050	-.18	52	Chge in ad/sales	.2330	1.21	-.0210	-.52
12	Change in sales	-.2842	-5.68**	.0529	1.12	53	Chge in t assets	-.5081	-8.10**	.0533	1.05
13	Change in dep	-.2175	-5.04**	.0530	1.38	54	Cash fl/ t debt	.0761	.22	-.2848	-.94
14	Change: div/sh	-.0230	-.39	-.0791	-1.53	55	W cap/t assets	.1321	5.87**	.0005	.02
15	dep/ pl assets	-.5655	-1.89	1.5165	4.90**	56	Change in #55	.0747	.92	.0921	2.55^
16	Change in #15	-.0074	-.16	.0125	.51	57	Op inc/t assets	-1.0489	-6.51**	.0179	.12
17	Oper ret/equity	-.1976	-2.75**	-.0383	-.29	58	Change in #57	-.0714	-2.17^	.0056	.13
18	Change in #17	.0029	.54	.0013	1.04	59	Chge: fund uses	-.0088	-.61	.0179	1.76
19	Ch: cap exp/TA	.0149	1.49	-.0007	-.94	60	Chge: fund srces	.0011	1.34	.0138	.99
20	#19, 1 yr lag	.0063	.90	-.0015	-.12	61	Repay: lt debt	-.0312	-.79	.1795	2.49^
21	Debt/equity	.0030	.40	-.0084	-1.81	62	Issuance: lt debt	-.2332	-3.01*	-.0169	-.24
22	Change in #21	.0888	1.12	-.0101	-.33	63	Purch: tr stock	1.3330	1.09	.3663	.39
23	LT debt/equity	.0043	.24	.0002	.02	64	Change in funds	-.0053	-.52	.0225	1.32
24	Change in #23	-.0013	-.29	.0043	.81	65	Change in lt debt	-.0037	-1.00	.0050	1.09
25	Eq/fixed assets	.0003	1.11	-.0006	-.76	66	Cash div (%)	.1612	1.52	.0231	.37
26	Change in #25	-.0360	-1.76	-.0068	-.19	67	Change in w cap	-.2792	-4.99**	.0631	1.14
27	Time int earned	.0000	-.04	-.0000	-.15	68	Net inc/cash fl	-.0050	-2.09^	.0771	2.24^
28	Change in #27	.0085	2.12	.0031	.33	69	t assets/ mk eq	24.2293	3.35**	-1.4477	-.42
29	Sales/TA	.0063	-4.21	-.0015	3.75**	70	Change in #69	-.2404	-5.15**	.0782	4.02**
30	Change in #29	.0006	.00	.1199	1.29	71	T assets/ bk val	-.0115	-1.64	.0091	1.09
31	Ret on TA	.4927	1.72	.0454	.17	72	Change in #71	-.2053	-2.91*	.0105	.08
32	Ret/ closing Eq	-.0185	-.10	.0013	.01	73	Bk val / mk eq	187.476	5.58**	26.006	1.17
33	Gross margin	.3692	2.64*	-.1428	-1.08	74	Change in #74	.0060	.09	.0472	1.52
34	Change in #33	.0401	.75	.0217	.49	75	earnings/ price	-.2073	-.68	-.0890	-1.48
35	Op pr /sales	.8493	6.15**	-.8082	-6.26**	76	Change in #75	.0019	.83	-.0015	-.16
36	Change in #35	-.0106	-2.27^	-.0084	-.70	77	R earn/t assets	.1303	1.26	-.2991	-3.08*
37	Pr-tx inc/sales	1.3050	7.96**	-.2434	-3.99**	78	Change in #77	.8649	6.37**	-.1697	-1.42
38	Change in #37	.0056	.82	-.0142	-1.83	79	Div/ t assets	1.4975	4.23**	-.1976	-.62
39	Net prt margin	1.6486	8.36**	-.2246	-3.57**	80	Change in #79	.0202	.61	-.0032	-.40
40	Change in #39	-.0038	-2.58*	-.0171	-2.09^	81	Cash/ t assets	.9345	4.08**	-.1755	-.81
41	Sales/tot cash	-.0004	-1.69	.0001	.85	82	Change in #81	.0119	1.25	-.0099	-1.05

Results of simple regressions of standardized, size-adjusted abnormal returns (SARs) onto various accounting ratios, as indicated.
"Recession-Associated" (Expansion-associated) indicates the results of regressions estimated with data pooled across different stages of the business cycle (recession-associated and expansion-associated business cycle-associated valuation change periods).
Columns reflecting the coefficient estimate are marked "β_1".
Significance test statistics (t) of coefficient estimates are provided in columns marked "t". ** indicates p<.001; * indicates p<.01; ^ indicates p<.05.

model had a correlation greater than .50. Multiple variable dependency tests were also conducted. After decomposition, no eigenvalues for either model were near zero and no condition numbers were near the 1000 value suggested by Myers [1992]. Together, the tests suggest that multicollinearity in the stepwise models is not severe and coefficients may be interpreted with assurance as to their stability.

The coefficient estimates, using pooled BVCP data, for the reduced stepwise model are presented in Table 3, columns a and d. Regressions conditioned on recession-associated and expansion-associated BVCPs are both significant at the .01 level.

The strength of association of ratios with subsequent recession-associated BVCP SARs, however, is much greater, as measured by adjusted r2, than with subsequent expansion-associated BVCP SARs. The difference in the magnitude of explanatory power is substantive, with adjusted r2 increasing to .095 from .011 across BVCP types.

All ratios, except change in working capital, are significant at the .05 level when the model is estimated using recession-associated BVCP data. On the other hand, change in inventory, depreciation over plant assets, operating profit to sales, and change in pre-tax income to sales are all insignificant when the model is conditioned on expansion-associated BVCP data.

The multiple regressions were repeated using unpooled BVCP data from each business cycle event studied. The results are presented in Table 3, columns b, c, e and f. The sub-period regressions confirm the pooled simple and multiple regression findings described above. Further, the unpooled results for the recession-sensitive reduced stepwise model show that acute sensitivity to recession-associated market valuation events is recurrent.

Several other possible explanations for the findings were also explored but are not reported on in detail. These included the following: tests for cross-sectional model misspecification with respect to total assets, sales, and firm growth rate; tests to determine if results were driven by outlier observations in the accounting ratio distributions; and cross-sectional tests of industry dependencies. Generally, none of these other possible explanations can generally account for the results presented here.

The Prediction Tests

As a check for robustness, prediction comparisons using holdout data were conducted. The multiple regression model reported upon earlier that was estimated with pooled, recession-associated BVCP data, was used to make predictions of risk-adjusted returns for three holdout periods, numbered 4, 5, and 6 in Table 1. The holdout periods 4 and 6 were "mis-matched" with the model in the sense that both represent data obtained from a dissimilar, expansion-associated, business cycle event. Period 5, however, is "matched" with the model in that this data was also obtained during a recession event. If accounting data have information content about stock returns obtained during recession, the prediction model should be well specified, with mean prediction errors for holdout data not significantly different from zero. On the other hand, in the case of a mis-match, mean prediction error for the mismatched holdout sample should be significantly different from zero, reflecting model bias from misspecification.

Table 4 presents the prediction results. The matched prediction of holdout period 5 produced the lowest overall level of mean prediction error, an amount that was insignificantly different from 0 (at the .01 level). For the unmatched conditions, in all cases, prediction error was significantly greater than zero, and, based on the test statistics, the difference was always substantial, with p-value below .005 in all cases. The results cannot be accounted for by simple time-dependency of associations, i.e.,

TABLE 3
Multiple Regression Results
Stepwise Model

		Recession-associated			Expansion-associated		
#	Accounting-based Ratio	a	b	c	d	e	f
		Pooled	Period 1	Period 3	Pooled	Period 2	Period 4
11	Chg in inv	-.5573*	-.3227^	-.6047*	-.1793	.0402	-.3200
13	Chg in dep	-.0861*	-.0006	-.3040*	.1637*	.2068^	.1790
15	Dep/pl assets	- .2194*	-.4250*	-.1229*	.1604	.3840*	-.0349
35	Op pr/ sales	.2560*	.1697*	.4014*	-.0360	.5689*	-.1147
38	Chg-pre tax inc/sales	.4047*	.4475*	.2292	.1678	.1266*	.2338
67	Chg in work cap	.0310	-.0550	-.1828	-.0181	-.0725	-.1054
79	Div/t assets	.1009*	.1070*	.1059	-.1115*	-.1524*	-.0689
	Adjusted r^2	.095	.078	.141	.011	.030	NMF
	F	16.89*	6.98*	14.11*	2.81*	3.38*	1.71
	N	1047	490	559	1132	529	603

Regression results for stepwise models developed from accounting ratios found, in simple regression tests, to be consistently, significantly associated with standardized, size-adjusted abnormal returns (SARs) from subsequent business cycle valuation change periods (BVCP).
Columns a and d used data that were pooled by BVCP type.
Columns b, c ,e and f used data from each individual BVCP.
Coefficients values are listed and marked for significance.
* indicates significance at the .05 level. ^ indicates significance at the .10 level.

TABLE 4
Tests of Mean Prediction Error
Across Matched and Unmatched Conditions

Prediction Conditions	Prediction Period Number*	Prediction Period Description	Mean error Prediction	Standard Deviation	t^2
Mismatched	4	Expansion-Associated 1975-1980	.07	1.01	2.92*
Matched-	5	Recession - Associated 1981-1982	-.04	.98	1 .67
Mismatched	6	Expansion Associated 1983-1987	-.14	.94	-5.84**

Accuracy of prediction when a recession-conditioned multiple regression model is used to predict subsequent risk-adjusted returns. Holdout prediction periods were intervals during which business cycle-associated valuation change periods (BVCPs) occurred., with types as indicated.
1) Prediction conditions are "matched" when the recession-sensitive (expansion-sensitive) model is used to predict returns in a recession-associated (expansion-associated) BVCP, and "unmatched" otherwise.
2)t-tests assume unequal variances. Results were similar, however, with or without the assumption of equal group variance. *** indicates p< .001; ** indicates p<.005; * indicates p<.01; ^indicates p<.05.

the time interval between estimation and holdout periods, because mismatched periods 4 and 6 are both closer and farther away in time proximity to the estimation periods as compared to period 5.

V. CONCLUSIONS

In this study, accounting ratios were found to contain conditional information about stock returns that occur during recession. Evidence of this conditional information content was manifested in three ways. First, a number of ratios were only significantly associated with stock returns obtained during recession. Second, the strengths of association were generally greater when stock return data was obtained during recession. Third, for some ratios, the direction of association systematically varied across the business cycle. Financial ratios thus appear to be acutely sensitive to recession-associated valuation events.

The results suggest that inter temporal risk factors associated with the business cycle play an important role in the pricing of publicly traded stocks. They also suggest that trading rule profits documented by Ou and Penman [1989], Holthausen and Larcker [1992], and others, might reflect omitted inter temporal risk factors associated with the business cycle. They might also account for the wide variability in performance of trading rules across different time periods.

The findings, taken together, suggest that ratio analysis can have an important role in investment decisions made in the context of the business cycle. To the extent that investors condition their expectations on heterogeneous notions of future business conditions, ratios may be used to support trading decisions conditioned on these expectations. They may also help establish the ranges of risk and possible return of an investment, depending on which state of the world is ultimately manifested. Such a posited role for ratio analysis may help explain a number of seemingly anomalous behaviors of the investment community. It may explain, for example, why the news media focuses so much attention on the likelihood of recessions and expansions. It may also explain why news media choose to provide conditional risk premium and fundamental analysis forecasts.[16]

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ENDNOTES

[1]See, among others, Nerlove [1968], O'Connor [1973], Ou and Penman [1989], and Holthausen and Larcker [1992].

[2]See Nerlove [1968], Ou and Penman [1989] and Holthausen and Larcker [1992], among others

[3]Examples of this phenomenon include Ou and Penman [1989] and Holthausen and Larcker [1992].

[4]See Ou and Penman, [1989; fig. 1] and Holthausen and Larcker [1992; Fig 1 and 2]. Furthermore, when Holthausen and Larcker's estimation and prediction sub-periods each contain recession-associated market valuation events, the abnormal returns earned by their trading strategy doubles in comparison to other sub-period combinations. Holthausen and Larcker further report that the trading rule employed by Ou and Penman does not work in the period 1983-1988 [Holthausen and Larcker, 1992; p. 375]. Holthausen and Larcker's trading rule also has relatively weaker results during this period, averaging just 5% in abnormal return per annum. The 1983-1988 sub-period is the only interval reported on by Ou and Penman [1989] and Holthausen and Larcker [1992] that does not contain a recession year.

[5]Fabozzi and Francis [1977], Kim and Zumwalt [1979], and Chen [1982] found little evidence of beta shifting across "bull" and "bear" markets. In these studies, however, "bull" and "bear" markets were defined using a non-buisness cycle definitions.

[6]See Beaver, Kettler, and Scholes [1970].

[7]This would be more likely for oligopolies. In more efficient markets, the effects of higher prices as demand increases would drive decisions to grow.

[8]Total assets over market equity and total assets over book value both indicate structural leverage. Cash over total assets measure the most readily available component of liquidity. Retained earnings over total assets and dividends over total assets proxy for dividend policy. Earnings to price and market to book equity have been indicated by previous research as having the ability to predict subsequent stock returns [Basu, 1977; Fama and French, 1992].

[9]An All Possible Regression procedure was the preferred approach because, unlike the Stepwise procedure, it considers all possible models and is not sensitive to the order of variable entry. Computer resource constraints, however, made Stepwise procedures the "satisficing" alternative of choice.

[10]Fama and French [1988], Kreuger and Johnson [1990] and Johnson [1992], among others, have used this business cycle definition.

[11]NBER dates provide for two separate recessionary periods from 1/80 to 7/80 and from 7/81 to 11/82. Both periods saw the S&P500 decline by just over 20%, the smallest amount of all the recessionary periods. The first associated valuation period is also of very short relative duration (less than 2 months) and falls within close time proximity to the longer interval. For these reasons, the two periods were combined and treated in this research as one recession-associated market valuation event under the conjecture that the same macroeconomic circumstances probably precipitated both events.

[12]For the combined BVCPs, periods 4 and 5, that have two onset dates, I counted through the first interval and then took the remainder needed from the second interval. If, for example, the first interval contained 30 trading days, I used all of these and 220 days from the second interval, beginning with it's onset date.

[13]Expansion-associated BVCPs average 1152 trading days in length whereas recession-associated BVCPs average only 421 days.

[14]Transforms that were tested included Logs, Squares, Cubes, Square roots, normalization and relative ranks.

[15]Lacking theoretical guidance, I used this positive evidence of strength of associaton to

select the ratio form that appeared best specified. For completeness, however, I also later re-examined the multiple regression models, using untransformed variables. The results did not differ substantively from what is reported here. The strength of association in most regressions, however, was substantively lower than when transformed ratios were used. For example, in the pooled, untransformed multiple regressions of the "best" recession sensitive model, adjusted r^2 was .056 and .008 using recession-associated and expansion-associated BVCP data respectively. The comparative adjusted r^2 for the same pooled, multiple regressions using transformed variables were .091 and .011 respectively.

[n]Dow Jones News Retrieval, for example, provides "up" and "down" betas for it's subscribers.