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Stock Market Return Expectations: Some General Properties

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Abstract

This paper examines how and how well do leading economists forecast stock market returns. This question is fundamental in finance, since the Capital Asset Pricing foundation rests upon assumptions about the properties of investors' expectations for stock market returns. The results reveal that economists' expectations of market returns as exemplified in Livingston's data do not meet the necessary conditions of efficiency. It should be noted however, that in later period some improvement in the quality of economists' forecasts was observed.

1. Introduction

HOW AND HOW WELL economists forecast macroeconomic indicators are matters that received much attention by economists in the recent years [6, 7, 11, 12]. It is surprising therefore, that almost no parallel research exists in the finance literature [1] concerning expectations of stock market returns. This observation is all the more striking, since the Capital Asset Pricing foundation of much of the current research in finance rests upon assumptions about the properties of investor's expectations for stock market returns [2]. This paper is an attempt to begin to fill this void.

Initially we investigate the question, "Are the Standard and Poor 425 expectations of economists good forecasts?" Ideally, "good" forecasts would be ones which would serve as a faithful proxy for actual overall market expectations. Unfortunately, this hypothesis is not testable [8]. We can, however, provide some indication of whether, as Capital Asset Pricing empirical investigations assume, these forecasts are good in the sense that they are not systematically biased. We can also establish if the forecasts are efficient according to Theil's criteria [9]. Do they provide more information than a simple naive alternative and is it possible to improve upon them by recognizing systematic forecasting errors? The robustness of the results is tested over time.

In addition, we address the issue of the rationale underlying the economists forecasts. Our paper is divided into the following sections: Section II describes our data source; Section III describes the methodology; Section IV presents our results and Section V outlines our conclusions.

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II. Data Sources

The data for this study were provided by J. A. Livingston of the *Philadelphia Inquirer* and covers the period from 1947 to 1974. This data have been used extensively in the literature [4, 10, 12]. Since 1947, Livingston has collected, at regular six-month intervals, forecasts for 10–12 economic indicators for the subsequent 6 and 12 months. Participants in Livingston's survey include about 60 well-known business, public and academic economists. Although this sample is limited in terms of the total number of participants in the equity markets, its validity as a surrogate for overall market expectations is supported by, at least, two important considerations. First, these economists and their respective organizations play a prominent role in the formation of expectations by the overall market. Secondly, the institutions they advised accounted for over 60 percent of all stock exchange trading during the late 1960's and through the early 1970's [1].

In generating the forecasts for the Standard and Poor 425 index, we followed Livingston's reporting precedent of equally weighting each economists's forecast. After reviewing Livingston's time table for collecting and subsequently reporting forecasts, we concluded that there was an average lag of about two months. Consequently, the economists' forecasting ability is examined using the actual 8 and 14 month horizons they faced.[1]

III. Methodology

Theil's method [9] is used in this study in examining the forecasting efficiency of the economists. In the spirit of Theil the following measure of forecasting efficiency can be defined:

$$U^2 = 1 - \sum_{t=1}^{N} (P_t - A_t)^2 / \sum_{t=1}^{N} A_t^2 \tag{1}$$

where:

N is the number of observations,
P_t is the predicted change during period t, measured as a log relative (P_t = ln (predicted level/current level))[2],
A_t is the actual change during period t, measured as a log relative, and
U^2 is Theil's statistic.

We can see from (1) that forecasters can receive a maximum efficiency rating of 1 for perfect forecasts declining to 0 for forecasts equivalent to, in effect, a permanent no change forecast and a negative rating for forecasts which are actually worse than a no change prediction.

[1] To clarify the forecasting horizons let us examine forecasts published by Livingston on January 1, 1978. The forecasts are for the subsequent 6 and 12 months: for June 30, 1978 and for December 31, 1978. However, the last actual figure available to the economists when the forecasts are made is about two months earlier (end of October). Hence, the economists face a forecasting horizon of 8 and 14 months.

[2] In order to avoid asymmetry problems, Theil [9, Chapter 3] recommends the use of log relatives instead of percentage changes.

The numerator in (1) is the important term. The denominator is simply a scaling factor to facilitate the interpretation of the measure. By decomposing the numerator, several useful insights can be obtained. The numerator can be decomposed as follows:[3]

$$\sum_{t=1}^{N} (P_t - A_t)^2 = N(\bar{P}_t - \bar{A}_t)^2 + N(S_P - rS_A)^2 + N(1 - r^2)S_A^2 \tag{2}$$

where

$\bar{P}_t$ and $\bar{A}_t$ are the mean values of P_t and A_t,
S_P and S_A are the standard deviations of P_t and A_t, and
r is the correlation coefficient between the predicted and realized changes.

For reporting the empirical results, we divide each term on the right-hand side of (2) by the total squared error to obtain:

$$N(\bar{P}_t - \bar{A}_t)^2 / \sum_{t=1}^{N} (P_t - A_t)^2 = U^M \tag{3a}$$

$$N(S_P - rS_A)^2 / \sum_{t=1}^{N} (P_t - A_t)^2 = U^R \tag{3b}$$

$$N(1 - r^2)S_A^2 / \sum_{t=1}^{N} (P_t - A_t)^2 = U^D. \tag{3c}$$

Hence, $U^M + U^R + U^D = 1$.

The interpretation of the three terms in (2) is based on a model of a forecaster's decision process. Suppose the forecaster regards any forecast as consisting of (1) a systematic and (2) a non-systematic part of the realization. It would be reasonable for the forecaster to concentrate attention on the systematic portion. If the forecaster is able to predict the systematic portion exactly, then the realization A_t can be viewed as consisting of the systematic portion P_t and a random component which has a zero mean and which is independent of P_t.

In this case, a regression of the form:

$$A_t = \alpha + \beta P_t + e_t \tag{4}$$

would yield $\alpha = 0$ and $\beta = 1$. As Granger and Newbold [5] correctly point out, $\alpha = 0$ and $\beta = 1$ does not indicate an optimal forecast, only that the forecaster is not throwing away information.[4] If the information is not thrown away, the random component has a zero mean. Therefore $\bar{A}_t$ and $\bar{P}_t$ must be equal so that the first term in (2) vanishes. Furthermore, the slope coefficient takes the form:

$$\beta = rS_A/S_P \tag{5}$$

If this coefficient is indeed 1, the second term in (2) also vanishes.

It follows that the mean square prediction error will then consist of only one term, the third, which is the variance of the unsystematic part as is easily verified. Needless to say, these statements apply to ideal conditions. When a finite number

[3] A discussion of decomposition methods can be found in Theil [9, Chapter 2]; Granger and Newbold [5] argues that Equation 2 is the more appropriate decomposition.

[4] An optimal forecast would have the highest explanatory power of the dependent variable A_t in (4). Ideally, a coefficient of determination of 1.

of observations is available, the first term will not be precisely zero and therefore, will be positive. A similar situation exists with respect to the second term. However, if the forecasters are not throwing away information, then we should observe that U^M and U^R are near zero and that α is near zero and β is near one. Errors leading to a positive U^M, U^R and U^D are called: level errors, regression errors and disturbance errors, respectively.

From the discussion above, efficient forecasts would be characterized by the following necessary conditions: $\alpha = 0$, $\beta = 1$, $U^M = U^R = 0$ and $U^D = 1$. These conditions will be tested in the study. It should be noted that if the first two conditions are fulfilled the forecast is unbiased and $\bar{P}_t = \bar{A}_t$. Yet, the sample means of the realizations and predictions may be equal when the first two conditions are not fulfilled.[5] The equality of the sample means will also be tested in this study.

The necessary conditions do not guarantee that the forecast is efficient. An efficient forecast should in addition be characterized by a high Theil's U^2 statistic. The statistic depends on the sum of the squared errors (numerator) and the denominator. The denominator can be viewed as a benchmark forecast (simple naive alternative) to which the performance of the investigated forecast (in our case economists' forecasts) is compared. In (1), the benchmark forecast represents no change. Therefore, the denominator consists of the sum of the squared actual changes. But, it is well known that the stock market in the long run exhibits an upward trend which leads to a construction of an additional U^2 statistic:

$$U_m^2 = 1 - \sum_{t=1}^{N} (P_t - A_t)^2 / \sum_{t=1}^{N} (T - A_t)^2 \tag{6}$$

where T is the long term trend in market returns and U_m^2 is the modified Theil's measure (the rest of the notation is unchanged). Fisher and Lorie [3] computed annual rates of return on stocks listed on the New York Stock Exchange. In this study, we use their annual rate of return derived over the period January, 1926 through December, 1946 which turned out to be 5.5 percent. The two statistics derived from Theil U^2 will be computed in this study. Negative values of the statistic would indicate that the forecast is not efficient: it cannot outperform a simple naive alternative.

The tests of the efficiency of forecasts described above do not distinguish between errors resulting from overestimation, underestimation and turning point errors (a turning point error occurs when the sign of the actual change does not correspond to the sign of the predicted change). Therefore, additional breakdown of the errors will be provided which will enable a better understanding of the economists' forecast rationale.

IV. Results

Forecasting Efficiency

Table I contains the results obtained using Theil's approach to forecast evaluation. The rows labeled No Trend correspond to computing Theil's measure by

[5] It may happen when $\alpha > 0$ and $\beta < 1$, or when $\alpha < 0$ and $\beta > 1$.

Table I

Decomposition of U^2 and Regression Statistics

Period	Horizon	U-No Trend	U-Trend	U^M	U^R	U^D	α	β	$t_{\alpha=0}$	$t_{\beta=1}$	$t_{\beta=0}$	df	F-statistic
April 1947 to Oct. 1974	8 month	0.087	−.001	0.028	0.063	0.909	0.031	0.553	1.780	−1.933	2.208	54	5.207
	14 month	0.089	−.061	0.058	0.056	0.886	0.062	0.434	2.463	−1.846	1.414	54	2.114
April 1947 to April 1956	8 month	0.062	−.238	0.403	0.075	0.523	0.083	0.531	3.705	−1.558	1.763	17	2.931
	14 month	−0.063	−.671	0.504	0.063	0.433	0.151	0.284	4.432	−1.573	0.623	17	0.487
Oct. 1956 to April 1965	8 month	0.112	−.023	0.037	0.108	0.855	0.038	0.443	1.331	−1.419	1.130	16	1.554
	14 month	0.238	−.010	0.101	0.025	0.874	0.058	0.670	1.521	−0.682	1.383	16	2.593
Oct. 1965 to Oct. 1974	8 month	0.090	.165	0.065	0.002	0.933	−0.035	0.900	−0.936	−0.190	1.715	17	2.883
	14 month	0.164	.218	0.155	0.069	0.776	−0.109	1.680	−2.187	1.226	3.029	17	8.526

(1), and those labeled Trend have been computed using (6).[6] The results will be presented according to the issues raised in the previous section.

1) Can we reject the hypothesis that economists' expectations of market returns meet the minimal conditions of efficiency?

Let us first examine the results for the total period. For the total period U^M and U^R are not very large. Together, they account for a total of 9.1 percent and 11.4 percent of the squared prediction error, for the 8- and 14-month forecasting horizons respectively. The estimated coefficients of the linear regression reveal that, $\alpha > 0$ and $\beta < 1$. To test whether the estimated coefficients are significantly different from the coefficients of efficient forecasts ($\alpha = 0$, $\beta = 1$) a t-test is performed. The lowest t-value reported in Table I is 1.78 which enables the rejection of the null hypothesis that the forecasts are efficient at the 5 percent significance level for a one-tailed test. Therefore, although the level and regression biases did not constitute a large proportion of the total squared error, a statistical test reveals that the forecasts are not efficient.

The rejection of the null hypothesis that $\alpha = 0$ and $\beta = 1$ does not necessarily imply that the means of predictions and realizations are not equal for the total period. Performing a t-test, the null hypothesis that $\bar{P}_t - \bar{A}_t = 0$ can be rejected at the 5 percent significance level for the two forecasting horizons. The t-values are -2.1 and -2.3 for the 8- and 14-month horizons, respectively, indicating that economists tend to underestimate the market return over these years. To test the direction of economist's forecasts deviations, a non-parametric test was also performed. According to Table II, out of 56 observations, there are 37 (24 + 11 + 2) and 36 (21 + 14 + 1) cases of underestimation for the 8- and 14-month forecasting horizons, respectively. A binomial test enables us to reject the null hypothesis that the probability of an overestimate is equal to the probability of an underestimate at the 1 percent significance level for the two horizon periods.

Turning to the sub-periods, in the 1947 to 1956 span (19 observations), the level bias (U^M) constitutes a serious problem and accounts for more than 40 percent of the squared prediction error. The level and regression bias together account for about 50 percent of the error. The estimated coefficients of the linear regression reveal that for the total period $\alpha > 0$ and $\beta < 1$. A t-test enables us to reject the null hypothesis that $\alpha = 0$ at the .01 percent significance level for the two forecasting horizons. Correspondingly, the null hypothesis that $\beta = 1$ can be rejected at the 6 percent significance level. In addition, the null hypothesis that $\bar{P}_t - \bar{A}_t = 0$ can be rejected. Performing a t-test, t values of -3.7 and -4.2 are obtained for the two forecasting horizons. Turning to a nonparametric test, out of 19 possible cases, there are 16 and 17 cases of underestimation for the two forecasting horizons, respectively.

Over the 1956 to 1965 span (18 observations), the forecasts appear more efficient. The level and regression biases account for less than 15 percent of the squared prediction error. Although the coefficients of the linear regression exhibit the same phenomenon as before, $\alpha > 0$ and $\beta < 1$, the t-values are not as large as for the first sub-period: The null hypothesis that the coefficients do not differ

[6] The use of a trend computed over a different long period does not alter substantially the results.

from these dictated by efficient forecasts can be rejected at the 9 percent level for three out of the four coefficients. During the first sub-period there was a strong tendency on the part of economists to underestimate the actual changes. During the second sub-period this tendency was reduced. Significance levels of 9 percent and 5 percent are required to reject the null hypothesis that $\bar{P}_t - \bar{A}_t = 0$ for the two forecasting horizons, respectively. The number of underestimates was also reduced during the second sub-period to a total of 12 for the two horizons.

In the final sub-period, 1965 to 1974 (19 observations), we see a marked difference between the 8- and 14-month forecasts. For 8-month forecasts, the high value of U^D (.933) combined with low t statistics for $\alpha = 0$ and $\beta = 1$, shows the strongest indication of efficient forecasts. However, the 14-month forecasts have a much lower U^D of .776 and a significant overestimation of the level bias (t-value of -2.187). For the two horizons, the null hypotheses that $P_t - A_t = 0$ and that the probabilities of an underestimate and overestimate are equal cannot be rejected at a 20 percent significance level.

In summary, Livingston's data seem to indicate that over the period examined the economists did not produce forecasts that met the minimum criterion of efficiency. The forecasts produced had, in general, level and regression biasses and, in addition, except for the last sub-period, exhibited a tendency of underestimating the actual change in the S&P 425 index. There is, however, some indication that the quality of the forecasts improved in the recent periods.

2) Are economists' forecasts better than naive, low-cost alternative forecasting methods?

The results so far indicate that the forecasts do not meet the minimum criterion of efficiency. But still, it is possible that these forecasts may be better than some other accepted alternatives. However, the results in Table I indicate that in general this is not the case. With the exception of the last sub-period, at least one of the two Theil's U^2 statistics is negative for each period and forecasting horizon. This result supports the conclusion that economists' forecasting ability, in the mean squared error sense, is not better than naive, low-cost alternatives. This conclusion is further supported by observing that only for the 8-month forecasting horizon for the total period and 14-month forecasting horizon for the second sub-period are the F statistics for the linear regressions significant at the 5 percent level. Therefore, economists' forecasts of market returns have not generally been significantly related to actual market returns. Again, this conclusion can be reinforced by examining the hypothesis that $\beta = 0$, resulting in exactly the same conclusion.

It should be noted that if the stock market is efficient, in the sense that it reflects all the publicly available information, an investor could expect to be rewarded only for bearing risk. In such a market, forecasters may not outperform simple alternatives derived from past data. But, from efficient forecasters we do not expect to observe a performance inferior to simple alternatives. The results in Table I show that for the total period and for the first two sub-periods the Theil U^2-trend statistic is negative, indicating a somewhat inferior performance, especially during the first sub-period. During the last sub-period, the forecasters achieved a somewhat better performance then the simple alternatives. This

Table II

Forecast Error Analysis

Actual Change In S & P	8 month				14 month			
	Over-Estimate	Under-Estimate	Turning Point Error[a]	Total	Over-Estimate	Under-Estimate	Turning Point Error[a]	Total
Increase	6	24	11	41	5	21	14	40
Decrease	2	4	9	15	1	3	12	16
Total	8	28	20	56	6	24	26	56
The number of cases in which the analists overestimated (underestimated) the change.	19 (6+4+9)	37 (24+2+11)		56	20 (5+3+12)	36 (21+1+14)		56

[a] A turning point error occurs when the sign of the actual change does not correspond to the sign of the predicted change.

Table III

Conditional Forecast Error Analysis

Actual Series 1st Return - 2nd Return		8 Month				14 Month			
		Correct Sign		Error		Correct Sign		Error	
		Econ	Eff. M	Econ	Eff. M	Econ	Eff. M	Econ	Eff. M
+	+	17	25	8	0	12	24	12	0
−	−	2	0	2	4	0	0	3	3
+	−	4	0	9	13	4	0	10	14
−	+	13	13	0	0	14	14	0	0
Total		36	38	19	17	30	38	25	17

reinforces the previous impression that an improvement in forecasting performance occurred in the more recent period.

Some Indications of the Rationale Underlying the Forecasts

If forecasters believe that the stock market is efficient, they should predict positive market returns. (Unless they think that stock market returns are sufficiently negatively correlated with other assets.) Table II can provide insight on whether or not economists forecast as though they agreed with the efficient market hypothesis. Apparently, they do not agree with this hypothesis. In the 8-month forecast, for example, they predicted negative market returns 17 (11 + 2 + 4)[7] out of 56 times. Similarly, for the 14-month forecast, they saw negative market returns 18 (14 + 1 + 3) out of 56 times.

Table III enables us to compare the performance of economists in predicting the sign of the change in the market index with the performance of a strategy based on the efficient market hypothesis. To obtain some insight into the nature of the errors, the performance of forecasts conditional on the last actual market return is provided. According to the efficient market forecasting strategy the predicted sign should always be positive. During the period examined, this strategy led 38 times to a correct forecast for the 8-month and 14-month horizons. Obviously, whenever the actual return was negative the efficient market strategy led to a mistake and it happened 16 times.[8]

The economists had a similar performance for the 8-month horizon by making 36 correct forecasts. However, for the 14-month horizon their forecast was inferior and they made only 30 correct forecasts. The majority of the mistakes made by the economists (17 out of 19 for 8-month and 22 out of 25 for 14-month period, respectively) occurred when the conditional return was positive. The economists erred by either predicting a negative return when the actual return turned out to be positive or by predicting a positive return when in reality it was negative. The

[7] According to Table II, in 11 cases the economists predicted a decrease in the market index when the actual change was an increase. In 6 cases (2 + 4) they predicted a decrease and the actual change was also a decrease.

[8] The total number of observations is 55. One observation is lost because the forecasts are conditional.

conditional returns were negative in 17 cases for the two forecasting horizons. The economists apparently did not expect the negative return to persist and in 15 cases (2 + 13) for the 8-month horizon and in all the 17 cases (3 + 14) for the 14-month horizon predicted a positive return. As it turned out, this strategy led to few mistakes because during the period examined there was a tendency for positive returns to follow negative returns.

It is important to note that the success of economists in predicting positive returns (79 percent and 68 percent for the two horizons) is much better than in predicting negative returns (35 percent and 24 percent for the two horizons). It should not come as a surprise because in general, over long periods, the stock market exhibits an upward trend and the number of positive returns is greater. Therefore, it is easier to succeed in predicting positive returns.

V. Conclusions

The following conclusions can be drawn from the results presented in this study about the expectations generated by leading economists on S&P 425:

1. Economists' expectations of market returns as exemplified in Livingston's data do not meet the necessary conditions of efficiency; there are significant level and regression biases.
2. In addition, the forecasts tended to underestimate the market return over the period studied.
3. The economists' forecasts may not be in agreement with the efficient market hypothesis; in many cases the economists predicted negative returns.
4. In general, naive low-cost models are not outperformed by the economists' forecasts.
5. Conclusions 1, 2 and 4 above, while valid for the overall test period, are questionable for the later period in which an improvement in the quality of economists' forecasts was observed.

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