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A STUDY OF PRICE FORECASTS

BY JOHN A. CARLSON

A data series on price expectations developed by Livingston are presented and analyzed. These semi-annual data (1947–75) have been widely used by researchers, but there are some problems with the series. After examining the nature of the price expectations series, the implied rates of inflation are discussed, and the accuracy of the forecasts are analyzed (including the impact of errors on revisions). Finally, extreme forms of the rational expectations model are criticized in the context of these data.

1. INTRODUCTION

"We have a very strict publication policy. ... [With rare exceptions] you're not allowed to print your first article for [seven] years after you take your PhD. ... In the twelve years since we and Yale started this, 72 learned journals have ceased publication. The survivors are half their old size and about three times their old quality. ... Keeping up with one's field is becoming almost a pleasure." Perrin (1965)

One could debate the desirability, if not the feasibility, of an atmosphere in which research, like good wine, is given enough time to reach the proper stage of maturity. In its absence, many of us, hoping to be first or fearing the obsolescence that accompanies delay, rush in as fast as prudence, referees, and editors will allow.

The foregoing remarks could apply to a myriad of topical areas. Here they are relevant to some studies that have made what seems to be premature use of a set of price expectations data. In view of the apparent widespread interest in these data and a belief in their potential usefulness for learning more about the process of inflation, this paper reports on a detailed look at the data. Specifically, the purpose of the ensuing presentation is threefold:

(1) To make available to the profession a carefully worked over series of data on price expectations.

(2) To comment on and examine the data a bit.

(3) To respond to a challenge put forth by a "rational expectations" view of the world.

The data in question come from a relatively small semi-annual survey of economists by Joseph Livingston, now with the Philadelphia Inquirer. Since 1947, Livingston has asked these economists, who are presumed to

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be knowledgeable observers of the state of the U.S. economy, to forecast a number of key economic variables. He then summarizes the results in his business outlook column usually printed in late June and late December.

Turnovsky (1970) was probably the first in a professional journal to publish an analysis of the forecasts of the CPI. To his credit he drew professional attention to these surveys. Unfortunately, he also set a pattern of uncritical acceptance of the data as copied out of the newspaper columns. Despite evident problems with the data, this cavalier attitude carried over to other users. As a result, judging from private conversations I have had, many economists believe that the data are "crummy" or "worthless." This judgment is, I think, unwarranted.

Like all historical statistics, the nature of the data should be as fully understood as possible to justify analytical observations and conclusions. The next section therefore provides some of the background that has been missing from other studies utilizing these Livingston data.

2. An Explication of the Livingston Price Forecasts[1]

Livingston's primary objective has been to collect data for journalistic purposes. As a journalist, as well as an economist, his responsibility is to give his readers insight into current thought about what is going to happen to the U.S. economy. In doing so, he is often confronted with problems on the timing of the available information.

To help understand the difficulty, consider a year-end Business Outlook column. In early November he must prepare his questionnaire for mailing to the participating economists. Along with the questionnaire he provides the most current data then available on the economic variables to be forecast. In the case of the CPI and the WPI the September data are usually the most current. If the questionnaire goes out in mid-November, the Bureau of Labor Statistics may have just released the October WPI figure. A week or so later the October CPI is released. Remember that there are 12 to 15 other items on the survey in addition to the CPI and WPI, although we shall concentrate here primarily on the CPI.

Livingston needs the responses back by early to mid-December in order to tabulate the forecasts and prepare his own analysis. Before the December column is printed, the November figures have been released. When there has been very little if any change between the September and November figures, he generally uses the arithmetic mean of the individual forecasts as his published consensus forecasts. The dilemmas arise when there have been substantial (and possibly unexpected) changes in the price indexes in the interim.

[1] I have benefited from correspondence with Mr. Livingston in preparing this section. While he has had a chance to see and react to earlier drafts, I take responsibility for any remaining errors in interpretation.

As a good example, late in 1957, the CPI stood at 121.1 in both September and October. The average of the forecasts when they came in was 121.2 for June, 1958. In effect, the forecast was for no change, or a very slight change. But, when the CPI was released for November, it was 121.6, or 0.5 over the figure given in Livingston's questionnaire when it was sent out.

This posed a problem. As a journalist, Livingston wanted to include the latest figure. But, with no adjustments, this would indicate that economists were predicting deflation: a decline from 121.6 to 121.2. He reasoned that this was contrary to their real expectations. Consequently, in presenting the data for publication, he revised the consensus upward by an average of 0.5, or by the amount of the change in the CPI from October (and September) to November. Thus, he showed a November index of 121.6 and a June 1958 forecast of 121.7.

A question which would naturally occur to statisticians is this: Had the respondents already taken into account, when they answered the questionnaire, the increase in the CPI in November? If so, obviously, the upward adjustment would have been misleading. But it was Livingston's judgment that the majority of respondents based their projections on the data given in the questionnaire. Moreover, since the replies were processed in the first half of December, the November CPI would not have been available to the respondents.

Lending support to this hypothesis, or judgment, was a special interim survey printed on March 13, 1949, which asked for revised forecasts for June and December, compared with forecasts for the same months published almost three months before (December 25, 1948). Both consensus figures changed by more than the intervening change in the actual index.

These adjustments have been made with increasing frequency since the mid-1960's, although not in every survey for which there was substantial inflation in the months preceding the business outlook column.[2] Whether or not one fully agrees with the appropriateness of these adjustments for journalistic purposes, anyone making analytical use of the published consensus forecasts should be warned that these represent Livingston's judgment about what his participants' consensus forecasts would have been had they too had all the information available to him shortly before publication dates. Furthermore, in my opinion, most of the adjustments are not so readily justified as the example given for late 1957.

Livingston has preserved all of the original data and made available the unadjusted individual forecasts of the CPI and WPI. He notified me that journalistic adjustments had been made in the data he publishes and

[2]For example, these adjustments were not made in the surveys published in June 1967, December 1970, and December 1972.

so I presume he has notified other users who have contacted him. Consequently, little is gained by arguing about the appropriateness of the published consensus forecasts for statistical analysis.[3] Instead we should turn our attention to how to make best use of the data that are available. In the next section, some of these questions are addressed.

3. The Implied Expected Rates of Inflation

Empirical studies of how interest rates or wage increases are influenced by expectations of inflation need some measure of the expected rate of inflation, which will be defined as a percentage increase in an index of prices over some time into the future. The forecasts in the Livingston surveys include anticipated levels of the CPI and the WPI. To convert these into expected rates of change, one needs to know the base value of the index and approximately how many months beyond that base the respondents think they are forecasting.

The first studies using Livingston's published consensus forecasts implicitly assumed that the December and June indexes were known. Thus, Turnovsky (1970), Turnovsky and Wachter (1972), Gibson (1972), and Pyle (1972) apparently computed the percentage change over the succeeding 6 and 12 months. For example, a consensus forecast for next December published this December was used to calculate the expected rate of inflation over the next 12 months. The problem with this is that Livingston himself did not know the value of the December index when he wrote his column. The participants in the survey were generally constrained, as noted above, to even earlier information.

Gordon (1971) recognized part of the timing problem and computed a seven-month change from November to June and a thirteen-month change from November to December of the following year. He also used the published data, so any questions about the consistency of Livingston's adjustments carry over to his data, but at least they reflect Livingston's judgment about the state of economists' expectations at the times the columns were published.

What does Gordon's procedure imply about the state of expectations of the participants at the time they sent in their questionnaires? If, as Livingston presumed, the responses were based on the information he provided with the questionnaire, such as the September CPI for a December survey, then seven months beyond September comes April and 13 months after September comes October. If the participants were really forecasting the following April and October indexes (which, incidentally, are the latest available for much of June and December, respectively), then Gordon's

[3]One of the most bothersome figures has been the 6-month-ahead forecast of the CPI in June 1954. This should have been 114.2 instead of the 111.9 that was printed. Interestingly, Severn (1973) decided to drop that observation on the basis of a homogeneity test.

figures would reflect the expected rates of inflation implied in the participants' forecasts. At least this, unlike the 6 and 12 month interpretation, is defensible on *a priori* grounds. It is not, however, consistent with evidence to be given shortly about what the participants thought they were predicting.

More recently a fair number of economists have obtained the individual responses to the Livingston surveys and have constructed their own expected inflation series for various uses, e.g., Wachtel (1974) and DeMilner (1975). Once the individual data are available, some of these timing issues become more evident. Olsen (1974), on the basis of the relative accuracy of inflation forecasts under alternative assumptions, comes to the same conclusion as the one presented below.[4]

The most plausible assumption, from what has been said about these surveys, is that a typical participant in a December survey knows the October index before he makes his forecasts for the values of the indexes that will be reported for June and December of the following year. This assumption implies the forecasts cover an 8-month span from October to June and a 14-month span from October to December. To check the validity of these assumptions, I conducted a small survey of my own.

At the end of each of Livingston's Business Outlook columns, there is a list of participants. I took 50 names which appeared at least once in each of the last three years and asked them what was the most recent value of the CPI that they were aware of at the time of sending back their forecasts and whether they were forecasting the April figure (available for much of June), the May figure (released in June) or the June figure (released in July). 32 responded, some not willing to pin down precise dates. I made no attempt to prod the other 18, because the answers received gave a fairly clear answer to the question of timing as shown in the following tabulation of numbers of respondents:

Month of Most Recent CPI Known at Time of Forecast		Month of the CPI Being Forecast		
September	October	April	May	June
8	22	0	4	25

The predominant pattern is that participants know the October figure and are forecasting 8 months ahead to the following June. About one out of every four do not take note of the October releases of the CPI. (For the

[4]Other recent studies are still using the forecasts as published in the Livingston columns, e.g., Lahiri (1976) and McGuire (1976). They both take a step in the right direction in postulating explicitly that the recorded forecasts reflect the "true" or relevant forecasts with an error, but they fall short of investigating the possible sources or nature of these errors.

WPI, only 4 indicated using September figures and 25 using October.) A few are making forecasts for the second quarter of the year and these are indicated as forecasts for May. Thus, while it is not precise, the forecast span is about 8 months, not 6 or 7. If the non-respondents to my survey tend to pay relatively less attention to the latest information, then possibly some larger portion should be viewed as knowing only the September index and projecting 9 months ahead.

Prior to 1969, when the CPI was released later than it is now, proportionately fewer (of those who participated and could remember) were aware of the October CPI when making a forecast. The average span was therefore probably more than 8 months for the CPI forecasts in the earlier years of the survey.

Several respondents cautioned me that they make broad estimates. I believe that these are honest best guesses. The implied warning is that they are not single-valued forecasts held with great conviction between two exact points in time. Nevertheless, for analytical purposes the following dates are in general conformity with the available evidence: (a) Expectations are formed, or at least submitted, late in November or early in December. (b) The most current available data are the October indexes. (c) Forecasts are of indexes eventually reported for the following June and December. Similar dates apply to the June survey: Expectations are formed in late May or early June with data available for April. The consensus forecasts so derived for the CPI are presented in Table 1 and for the WPI in Table 2. Additional statistics are presented in a data appendix.

The expected inflation rates implied by consensus forecasts of the WPI are calculated in the same way as those with the CPI. Therefore, a description of Table 1 will serve as a description of Table 2 as well. The actual CPI's recorded in Table 1 are the figures for two months before the survey month, since this is the latest official information about the index available to the respondents before they record their forecasts.

The number of respondents making a forecast of the CPI for 6, 12, and 18 months beyond the survey month are recorded beside the arithmetic means of each set of forecasts. The expected inflation rates inferred from these mean or consensus forecasts are also recorded in Table 1. The calculation and interpretation of these rates requires some explanation.

In all cases, expected inflation has been expressed at an annual rate. The procedure has been to convert the expected percentage change to a monthly rate and then to compound that 12 times to get a figure for the rate of inflation that would occur over the next year if that monthly rate of inflation were to continue for the next 12 months.

As an example, consider the survey in December, 1973. The October CPI stood at 136.6 and the average of the forecasts for the following June was 141.42, which represents approximately a 3.53 percent increase expected over an eight month period. The expected inflation rate of 5.34

TABLE 1

FORECASTS OF THE CPI IN THE LIVINGSTON SURVEYS, 1947–75. NUMBERS OF RESPONDENTS, ARITHMETIC AVERAGES, AND EXPECTED INFLATION RATES.

Survey Month $t+2$	Actual CPI[a] P_t	6-Month Forecasts			12-Month Forecasts			18-Month Forecasts		
		No.	Mean[b] $P^*_{6,t+2}$	Rate[c] $\pi^*_{6,t+2}$	No.	Mean[b] $P^*_{12,t+2}$	Rate[c] $\pi^*_{12,t+2}$	No.	Mean[b] $P^*_{18,t+2}$	Rate[c] $\pi^*_{18,t+2}$
June 47	156.2	28	150.36	−5.56	28	144.16	−6.64	26	141.33	−5.83
Dec 47	163.8	32	166.87	2.83	32	163.75	− .03			
Jun 48	169.3	32	169.19	−.10	28	166.30	−1.52	27	162.39	−2.47
Dec 48	173.6	32	171.47	−1.84	32	168.58	−2.48			
Mar 49[d]	170.9	35	167.67	−4.47	34	164.28	−4.22			
Jun 49	169.7	36	162.06	−6.68	34	158.71	−5.58	32	157.56	−4.35
Dec 49	168.5	36	166.67	−1.63	34	164.09	−2.25			
Jun 50	167.3	43	168.66	1.22	43	167.36	.03	39	166.03	−.46
Dec 50	174.8	38	179.03	3.65	36	183.00	4.01			
Jun 51	184.6	44	187.73	2.55	42	190.20	2.60	42	190.65	1.96
Dec 51	187.4	49	189.65	1.81	49	191.86	2.03			
Jun 52	188.7	45	189.16	.36	44	187.95	−.34	39	186.05	−.84
Dec 52	190.9	53	190.53	−.29	53	188.85	−.92			
Jun 53	190.1	45	188.82	−1.01	44	186.77	−1.50	43	185.05	−1.60
Dec 53	115.4	52	114.51	−1.16	52	113.95	−1.08			
Jun 54	114.6	49	114.20	−.52	48	114.45	−.11	48	114.83	.12
Dec 54	114.5	44	114.62	.15	46	114.57	.05			
Jun 55	114.2	50	114.58	.50	48	114.56	.27	47	114.55	.18
Dec 55	114.9	50	115.52	.81	51	115.62	.54			
Jun 56	114.9	48	115.17	.35	45	115.57	.50	43	115.79	.46
Dec 56	117.7	47	118.81	1.42	48	119.18	1.08			
Jun 57	119.3	53	120.21	1.14	52	120.96	1.19	50	121.74	1.22
Dec 57	121.1	60	121.16	.07	60	121.43	.23			
Jun 58	123.5	58	123.55	.06	58	123.97	.32	55	124.82	.64
Dec 58	123.7	61	124.23	.64	60	124.85	.80			
Jun 59	123.9	61	124.41	.62	60	125.34	1.00	59	126.04	1.03
Dec 59	125.5	57	126.29	.95	56	127.02	1.04			
Jun 60	126.2	52	126.58	.45	52	127.23	.70	52	127.76	.74
Dec 60	127.3	61	127.46	.19	60	128.25	.64			
Jun 61	127.5	58	128.36	1.01	56	129.21	1.15	55	130.03	1.18
Dec 61	128.4	62	129.31	1.07	62	130.21	1.21			
Jun 62	105.2	57	105.91	1.02	57	106.51	1.06	57	107.19	1.13
Dec 62	106.0	61	106.70	.99	62	107.36	1.10			
Jun 63	106.2	55	106.93	1.03	53	107.51	1.05	52	108.07	1.05
Dec 63	107.2	59	107.79	.82	58	108.43	.98			
Jun 64	107.8	55	108.58	1.09	54	109.36	1.24	53	110.02	1.23
Dec 64	108.5	58	109.43	1.29	57	110.06	1.23			
Jun 65	109.3	53	109.99	.94	52	110.67	1.07	51	111.40	1.15
Dec 65	110.4	64	111.55	1.57	65	112.56	1.68			

TABLE 1 (*continued*)

Survey Month $t+2$	Actual CPI[a] P_t	6-Month Forecasts No.	6-Month Forecasts Mean[b] $P^*_{6,t+2}$	6-Month Forecasts Rate[c] $\pi^*_{6,t+2}$	12-Month Forecasts No.	12-Month Forecasts Mean[b] $P^*_{12,t+2}$	12-Month Forecasts Rate[c] $\pi^*_{12,t+2}$	18-Month Forecasts No.	18-Month Forecasts Mean[b] $P^*_{18,t+2}$	18-Month Forecasts Rate[c] $\pi^*_{18,t+2}$
Jun 66	112.5	49	113.87	1.83	49	115.23	2.08	47	116.47	2.10
Dec 66	114.5	59	116.06	2.06	59	117.43	2.19			
Jun 67	115.3	50	116.94	2.14	49	118.53	2.40	49	120.11	2.48
Dec 67	117.5	56	119.58	2.66	56	121.39	2.83			
Jun 68	119.9	54	122.36	3.09	53	124.25	3.10	51	125.88	2.96
Dec 68	122.9	57	125.12	2.72	57	127.08	2.91			
Jun 69	126.4	42	129.04	3.15	42	131.49	3.44	40	133.59	3.38
Dec 69	129.8	49	132.86	3.55	49	135.27	3.60			
Jun 70	134.0	47	137.11	3.50	47	139.71	3.64	47	142.18	3.62
Dec 70	137.4	49	140.64	3.56	49	143.51	3.80			
Jun 71	120.2	45	123.30	3.90	44	126.00	4.12	43	128.42	4.05
Dec 71	122.4	54	124.86	3.03	57	127.03	3.23			
Jun 72	124.3	48	127.24	3.57	47	129.83	3.80			
Dec 72	126.6	57	129.32	3.24	58	131.75	3.48			
Jun 73	130.7	51	134.25	4.11	48	137.14	4.21			
Dec 73	136.6	51	141.42	5.34	52	145.17	5.36			
Jun 74	143.9	51	150.65	7.12	51	155.45	6.84			
Dec 74	153.0	57	160.73	7.67	57	166.47	7.50			
Jun 75	158.6	52	164.41	5.54	51	169.06	5.62			
Dec 75	164.6	51	170.95	5.84	51	175.88	5.85			

[a] Actual CPI (or WPI) two months before the survey month. The base years are as follows:

Base Year	For Surveys	
1935–39	Jun 47–Jun 53	CPI
	Jun 47–Jun 51	WPI
1947–49	Dec 53–Dec 61	CPI
	Dec 51–Dec 61	WPI
1957–59	Jun 62–Dec 70	CPI and WPI
1967	Jun 71	CPI and WPI

[b] Arithmetic mean (consensus) of the individual forecasts of the index 6, 12, and 18 months beyond the survey month.

[c] Expected inflation at annual rates implied by consensus forecasts in accordance with the following formulas:

$$\pi^*_{6,t+2} = (P^*_{6,t+2}/P_t)^{12/8} - 1$$

$$\pi^*_{12,t+2} = (P^*_{12,t+2}/P_t)^{12/14} - 1$$

$$\pi^*_{18,t+2} = (P^*_{18,t+2}/P_t)^{12/20} - 1$$

[d] Special interim survey with revised forecasts for June and December, 1949. In the calculation of expected inflation rates the exponent is 12/5 for the June forecast and 12/11 for December.

TABLE 2

FORECASTS OF THE WPI IN THE LIVINGSTON SURVEYS 1947–75. NUMBERS OF RESPONDENTS, ARITHMETIC AVERAGES, AND EXPECTED INFLATION RATES.

Survey Month $t+2$	Actual WPI[a] P_t	6-Month Forecasts			12-Month Forecasts			18-Month Forecasts		
		No.	Mean[b] $P^*_{6,t+2}$	Rate[c] $\pi^*_{6,t+2}$	No.	Mean[b] $P^*_{12,t+2}$	Rate[c] $\pi^*_{12,t+2}$	No.	Mean[b] $P^*_{18,t+2}$	Rate[c] $\pi^*_{18,t+2}$
Jun 47	147.7	28	134.80	−12.81	28	128.80	−11.07	25	126.98	−8.67
Dec 47	158.5	32	160.12	1 54	32	155.48	−1.63			
Jun 48	162.8	33	164.62	1.68	28	161.59	−.64	27	157.35	−2.02
Dec 48	165.2	32	160.90	−3.88	32	157.38	−4.07			
Mar 49[d]	160.6	35	155.23	−7.84	34	151.59	−6.11			
Jun 49	156.9	35	147.43	−8.92	33	144.42	−6.86	31	144.55	−4.80
Dec 49	152.2	36	148.58	−3.54	34	145.24	−3.94			
Jun 50	159.9	43	156.03	3.09	43	154.50	.90	39	152.15	−.30
Dec 50	169.1	39	178.38	8.35	37	183.57	7.29			
Jun 51	183.6	44	185.83	1.83	42	188.54	2.30	43	189.26	1.84
Dec 51	178.1	49	181.10	2.54	49	183.35	2.52			
Jun 52	111.8	46	111.78	−.02	45	110.02	−1.36	40	107.67	−2.23
Dec 52	111.1	53	109.74	−1.84	53	107.21	−3.01			
Jun 53	109.4	46	107.83	−2.15	45	105.93	−2.72	44	103.80	−3.11
Dec 53	110.2	54	107.29	−3.94	54	106.54	−2.86			
Jun 54	111.0	49	110.42	−.78	48	110.77	−.18	48	111.61	.33
Dec 54	109.7	45	109.94	.32	47	109.90	.16			
Jun 55	110.5	50	111.01	.69	48	110.95	.35	47	110.90	.21
Dec 55	111.6	51	112.43	1.11	53	112.42	.63			
Jun 56	113.6	48	114.46	1.14	45	114.91	.99	43	114.91	.69
Dec 56	115.6	47	116.94	1.75	48	117.03	1.06			
Jun 57	117.2	55	118.12	1.18	54	118.65	1.06	52	119.54	1.19
Dec 57	117.8	60	116.52	−1.62	60	116.95	−.62			
Jun 58	119.3	58	119.11	−.23	58	119.78	.35	55	120.67	.69
Dec 58	119.0	61	119.46	.58	60	120.14	.82			
Jun 59	120.0	61	120.64	.80	60	121.77	1.26	59	122.48	1.23
Dec 59	119.1	58	120.54	1.82	57	121.08	1.43			
Jun 60	120.0	52	120.26	.32	52	120.69	.49	52	121.02	.51
Dec 60	119.6	61	119.27	−.41	60	119.84	.17			
Jun 61	119.4	57	119.93	.66	56	120.74	.96	55	121.42	1.01
Dec 61	118.7	61	119.48	.99	62	120.20	1.09			
Jun 62	100.4	57	100.40	−.01	57	100.47	.06	57	100.71	.19
Dec 62	100.6	60	100.86	.39	61	101.27	.57			
Jun 63	99.7	55	100.56	1.29	53	101.05	1.16	50	101.35	.99
Dec 63	100.5	58	100.77	.41	57	101.08	.50			
Jun 64	100.3	52	100.81	.76	51	101.29	.85	50	101.58	.77
Dec 64	100.8	57	101.09	.43	56	101.47	.57			
Jun 65	101.7	53	102.67	1.43	52	103.03	1.12	51	103.27	.92
Dec 65	103.1	63	104.32	1.78	62	105.18	1.73			

TABLE 2 (*continued*)

Survey Month $t+2$	Actual WPI[a] P_t	6-Month Forecasts No.	6-Month Forecasts Mean[b] $P^*_{6,t+2}$	6-Month Forecasts Rate[c] $\pi^*_{6,t+2}$	12-Month Forecasts No.	12-Month Forecasts Mean[b] $P^*_{12,t+2}$	12-Month Forecasts Rate[c] $\pi^*_{12,t+2}$	18-Month Forecasts No.	18-Month Forecasts Mean[b] $P^*_{18,t+2}$	18-Month Forecasts Rate[c] $\pi^*_{18,t+2}$
Jun 66	105.5	49	106.90	2.00	49	107.90	1.95	47	108.83	1.88
Dec 66	106.2	58	106.98	1.10	58	107.77	1.26			
Jun 67	105.3	49	106.71	2.02	49	107.91	2.12	49	108.81	1.99
Dec 67	106.1	56	107.67	2.22	57	108.86	2.23			
Jun 68	108.3	50	110.27	2.75	49	111.48	2.51	46	112.47	2.29
Dec 68	109.1	56	110.51	1.95	56	111.49	1.87			
Jun 69	111.9	44	113.93	2.74	44	115.29	2.59	42	116.64	2.52
Dec 69	114.0	46	115.99	2.63	46	117.49	2.62			
Jun 70	116.6	45	118.33	2.23	45	119.82	2.36	46	121.06	2.28
Dec 70	117.8	45	119.48	2.14	45	121.06	2.37			
Jun 71	113.3	38	115.77	3.29	37	117.92	3.48	37	119.74	3.37
Dec 71	114.4	48	116.08	2.21	51	117.56	2.36			
Jun 72	117.5	39	120.05	3.27	38	122.22	3.43			
Dec 72	120.0	48	123.23	4.07	49	125.50	3.92			
Jun 73	130.7	41	135.16	5.17	39	138.45	5.06			
Dec 73	139.5	42	145.44	6.46	43	150.18	6.53			
Jun 74	152.7	44	162.88	10.16	43	168.16	8.62			
Dec 74	170.2	49	178.37	7.29	49	184.53	7.18			
Jun 75	172.1	47	177.33	4.59	47	182.47	5.14			
Dec 75	178.9	44	186.04	6.05	44	192.61	6.53			

percent shown in Table 1 was calculated by raising 1.0353 to the 12/8 power. Taking the 8th root provides an estimate of the expected monthly rate of inflation. It is a geometric average. Raising that to the 12th power expresses consensus expected inflation at an annual rate.

This is called a six-month forecast of the rate of inflation between December and June even though it was originally calculated over an eight month period. Any events which take place in November and are known to the respondents can influence their forecasts, but if they do not at the time know the November CPI it would be improper to base a projection on that figure.

The same reasoning applies to the longer forecasts. If the CPI is forecast for 14 months beyond the latest known figure, then the 14th root of the ratio of the forecast to the actual CPI gives the (geometric) average rate of inflation expected per month. Raising it to the 12th power, or compounding it 12 times, again provides a figure at an annual rate. This is the 12-month or year-ahead forecast of the rate of inflation.

Forecasts of the level of a price index have tended to be low when inflation increases. In such instances, if one keeps the consensus forecasts

but moves the base index up a month or two beyond what is known to the respondents, the errors in forecasting the inflation rate will appear to be even greater than they actually are. This is because the base index is above what the participants would have predicted on average when they made their forecasts of future values of the index. That would explain why Olsen (1974) found inflation rates were more accurately forecast using a base for two months before the survey month rather than one month before or concurrently.

An important reason for being careful about the timing issue is that inflation expectations data are and will often be compared with other variables expressed at annual rates, e.g., wage increases and interest rates. Cargill (1976) comments that which forecast horizon one uses "makes no difference with respect to the significance of the relationship between anticipated price changes and interest rates, though it is relevant for investigating the completeness of incorporation of inflationary expectations into interest rates." I agree with the latter part of this statement, but the first part may not be correct. In replications of Lahiri's (1975, 1976) wage and interest-rate equations, the revised data do improve the statistical significance of the relationships. It is not clear yet how much of the improvement is attributable to removing inconsistencies in the published data and how much to the choice of horizon in obtaining the expected inflation rates.

One other set of figures for expected inflation can be inferred from Livingston's columns. In 1971, he began asking for forecasts of real GNP in addition to forecasts of nominal GNP. These are recorded in Table 3.

At the time the forecasts are made, the GNP figures for the preceding quarter are known to the respondents. They are making forecasts for 2 and 4 quarters beyond the quarter of the survey. Therefore, the expected inflation rates implicit in the consensus forecasts can be calculated in a manner analogous to the figures developed for the CPI and WPI forecasts.

For the 2-quarter ahead forecasts, take the ratio of the implicit consensus forecast of the GNP deflator to its actual value in the preceding quarter. The cube root of this ratio gives the geometric average inflation rate per quarter. Then, raising that average to the 4th power expresses the implicit expected inflation at an annual rate. The results are shown in Table 3 as expected inflation rates under the heading for 2-quarter forecasts.

Similar calculations provide the implied expected rates of inflation over the 4 quarters after the survey. These are also shown in Table 3.

These series do not extend far enough back in time to get much historical perspective. They do generally follow the ups and downs in the rates calculated from the CPI and WPI forecasts and their order of magnitude is about the same.

TABLE 3

EXPECTED INFLATION RATES IMPLIED BY FORECASTS OF GNP AND REAL GNP

Survey Date	Preceding Quarter			2-Quarter Forecast				4-Quarter Forecast			
	GNP	Real GNP	Implicit Price Index P^*_{t-1}	GNP	Real GNP	Implicit Price Index P^*_{t+2}	Expected Inflation Rate	GNP	Real GNP	Implicit Price Index P^*_{t+4}	Expected Inflation Rate
Jun 1971	1018.4	731.6	139.2	1078	753	143.2	3.81	1126	773	145.7	3.70
Dec 1971	1059.0	743.6	142.4	1129	775	145.7	3.07	1178	797	147.8	3.02
Jun 1972	1103.2	761.0	145.0	1184	798	148.4	3.14	1239	818	151.5	3.57
Dec 1972	1162.2	795.3	146.1	1249	831	150.3	3.82	1297	851	152.4	3.42
Jun 1973	1235.5	827.1	149.4	1315	854	154.0	4.13	1358	866	156.8	3.96
Dec 1973	1304.4	841.6	155.0	1368	847	161.5	5.65	1418	858	165.3	5.27
Jun 1974	1351.8	832.0	162.5	1444	843	171.3	7.30	1512	859	176.0	6.61
Dec 1974	1411.6	821.1	171.9	1480	809	182.9	8.64	1551	823	188.5	7.63
Jun 1975	1419.2	782.3	181.4	1507	800	188.4	5.15	1593	824	193.3	5.22
Dec 1975	1497.8	804.6	186.2	1624	837	194.0	5.68	1714	861	199.1	5.51

Sources: GNP, and Real (constant 1968 dollar) GNP from *Survey of Current Business*, April and October issues Forecasts of GNP, Real GNP from J. A. Livingston's semi-annual Business Outlook columns, *Philadelphia Inquirer*

$$\text{Implicit price index} = \text{GNP}/\text{Real GNP}) \times 100$$

$$\text{Expected inflation rate} = (P^*_{t+j}/P_{t-1})^{4/(1+j)} - 1$$

where $j = 2$ for forecasts two quarters ahead and $j = 4$ for forecasts 4 quarters ahead.

Since the end of 1972 the shorter forecast of inflation has been above the longer forecast, indicating at each survey date a consensus expectation that inflation would decelerate. At each succeeding survey, however, the expected rate went up. The higher the expected inflation rate in this 4-year period the stronger the indication that inflation, which was worse than had been expected, would not be as bad in the future. As indicated in the next section this pattern of expecting inflation to come down over time is not, in general, evident in the forecasts of the CPI and WPI.

4. The Accuracy of the Forecasts

Tables 1 and 2 summarize some of the many statistics available from the individual forecasts of the CPI and WPI. A few points can be made by simple inspection of the data.

1. The consensus expected inflation rates in each survey in recent years are remarkably similar whether over the next six months, year, or year and a half. Since 1957, with the exception of 1974, the year-ahead expected inflation rates for the CPI have been consistently above the six-months ahead forecasted rates but not by much. For the WPI forecasts, there is not even that consistency.

2. The variations between surveys are somewhat more pronounced than variations expected over longer periods as of a particular survey date, but the between-survey changes themselves are generally not abrupt. With data from 1952 to 1970, the correlation between the six-month and the twelve-month expected inflation rate is .981, while between the six-month rate and its value lagged six months, the correlation is .906. Even the advent of wage-price controls prior to the survey in late 1971 reduced the expected inflation rate just a half year ahead by less than one percentage point. Forecasts of inflation rates in the WPI are slightly more volatile but even there the changes are not dramatic.

3. Data presented in the appendix show no evident tendency for the dispersion of individual expected inflation rates to become greater the farther into the future the forecasts go. In fact, since 1968 the standard deviations are smaller the greater the forecast span. I had not expected this result. Perhaps the dispersion would have been greater if the surveys had asked for expected rates rather than levels, but the participants are knowledgeable forecasters and may well have relatively less disagreement about inflation rates over longer periods into the future.

Now, how accurate have these forecasts been? To put the question in more fashionable terminology, have the consensus forecasts made "efficient" use of information available at the time? The "efficient market" literature, e.g., Fama (1970), assumes that a market "fully utilizes" all relevant information. A market, of course, consists of individual transactors who make decisions about buying and selling based on current in-

formation and expectations about the future. The implication is that on average these transactors correctly perceive what the market price will be, except for a random error that arises because of intervening events which were not foreseen or the effects of which on the market price could not have been predicted precisely.

Thus, one test of the hypothesis that forecasts are "efficient" is to examine errors in forecasting. If the errors do not appear to move randomly from survey to survey, this could be taken as evidence against the hypothesis. It is a very weak test, however. Even systematic errors cannot constitute a clear refutation of the hypothesis that information is fully utilized. Since inflation may be considered a manifestation of disequilibrium (i.e., demand generally in excess of supply or, as Gordon and Hynes (1970) postulate, demand in excess of perceived demand), then no matter what the forecast, there could be feedback effects that force the forecast to be systematically wrong, if it was believed and utilized in pricing decisions. This type of argument has been developed by Carlson (1967) as a possible explanation for the systematic errors of businessmen's sales expectations.

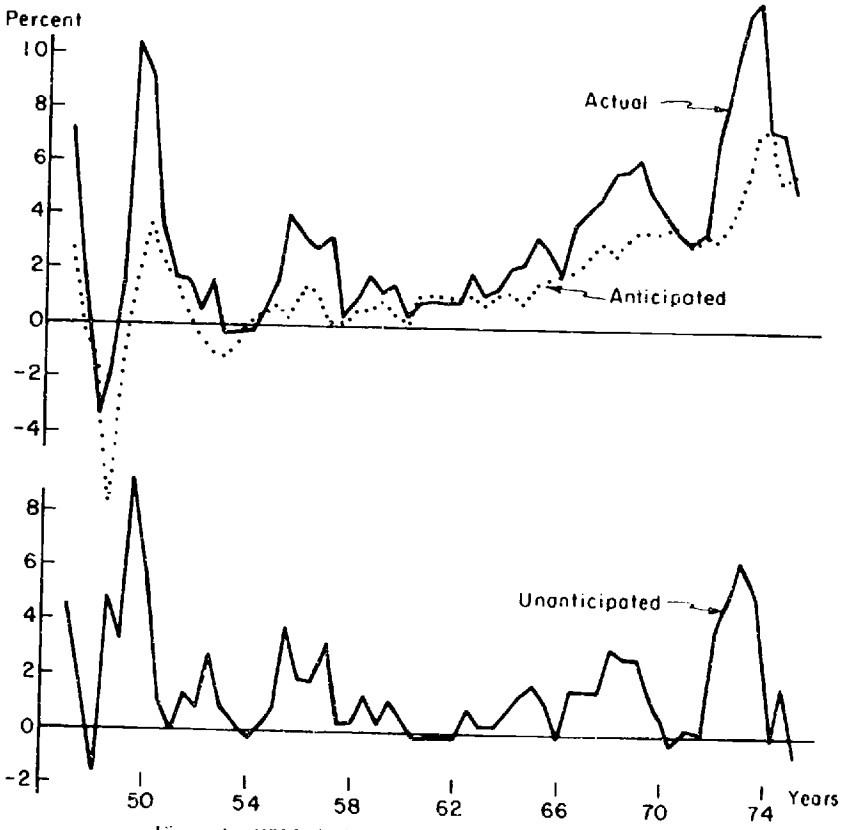

Figure 1 CPI Inflation 8-Months Ahead at Annual Rates

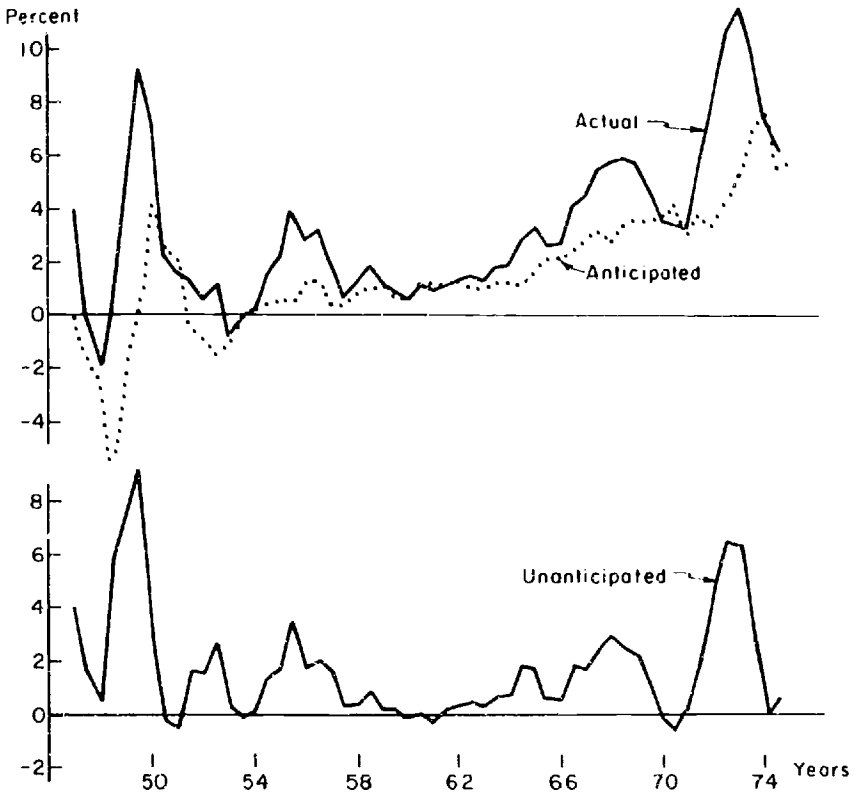

Figure 2 CPI Inflation 14-Months Ahead at Annual Rates

Figures 1 through 4 depict expected, actual, and unanticipated inflation based on consensus responses to the Livingston surveys. Unanticipated inflation is defined as the actual percentage change (at an annual rate) from a known value of a price index (CPI or WPI) to its value 8 or 14 months ahead minus the expected inflation rate over the same period. For example, Figure 1 shows that from 1947 through 1975 the inflation rate for the CPI 8 months ahead was overestimated in only 10 of the 58 surveys. Furthermore, in addition to being more frequent, the errors in predicting the CPI are much larger when the increase in prices has been underestimated. The largest errors are associated with the advent of the Korean War in 1950, an expectation of deflation in mid 1953, an unexpected price surge in 1956 57, underestimating the acceleration of inflation in 1965 and again in 1967 69, and finally the post-controls and resource shortage inflation in 1973 74. Virtually the same story can be told for the 14-month-ahead forecasts of the CPI.

Were the forecasts inefficient? Did they fail to make full use of the information available? Simple binomial tests reveal that such overwhelmingly one-sided errors are so unlikely, if positive and negative errors have an

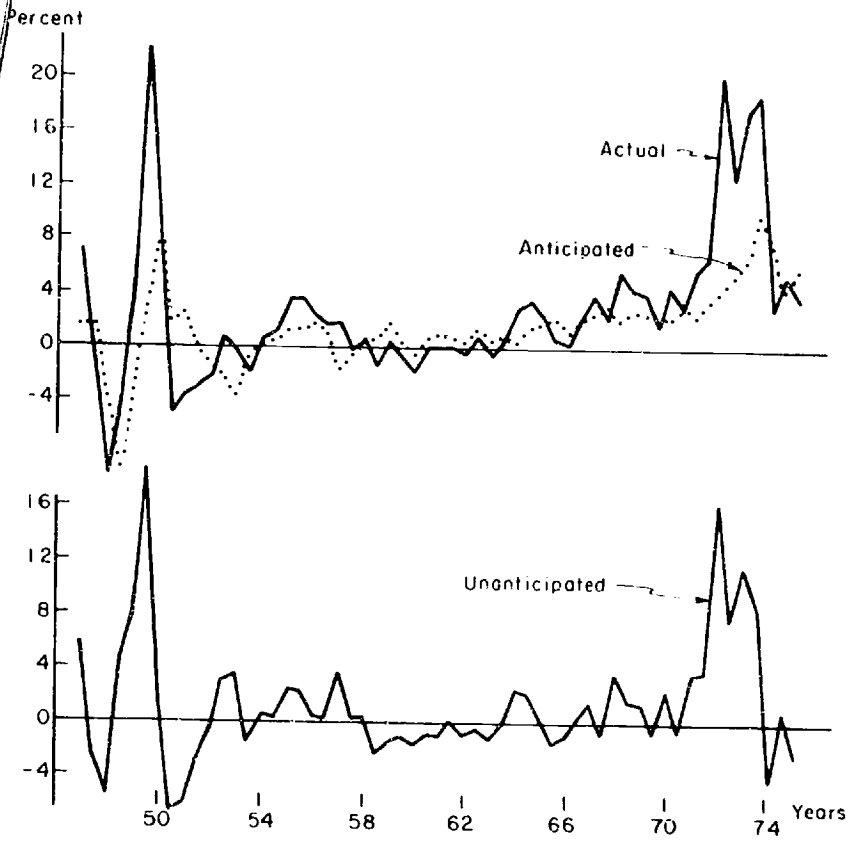

Figure 3 WPI Inflation 8-Months Ahead at Annual Rates

equal chance of occuring, that one is compelled to reject the hypothesis of purely random errors in forecasting the CPI. But is it because the respondents were inefficient in their use of information? I think not. Unpredictable events came along during these years primarily on the side of accelerating inflation. Perhaps there is an element of wishful thinking in the forecasts that leads to underprediction of inflation but even more compelling is the learning hypothesis. As it is learned throughout the economy that demand is higher than originally perceived, then prices are raised by more than had been expected and planned.

Unanticipated inflation as it relates to the WPI is pictured in Figures 3 and 4. The WPI is more volatile than the CPI and so the vertical scales are different. The same distance on the WPI graphs represents twice as large a difference as on the CPI graphs. The larger errors occur at about the same times as they did with the CPI, but the WPI is more frequently overestimated. In a six-year period 1958 63 there are 12 consecutive surveys in which the WPI consensus forecast 14 months ahead is too high. The balance of the WPI forecasts are on the low side although not as over-

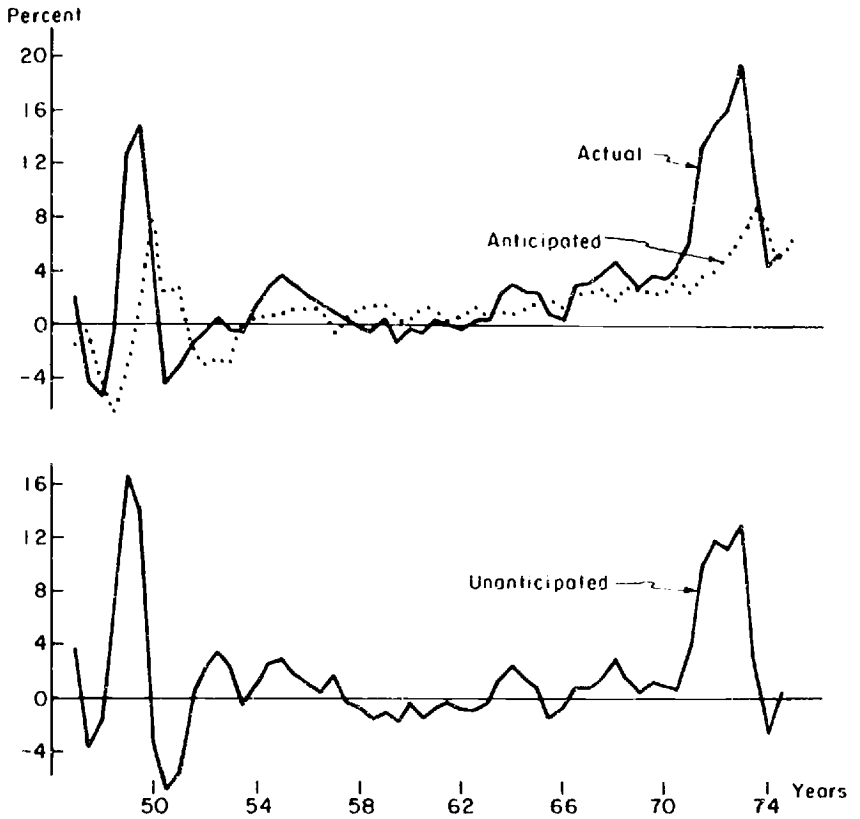

Figure 4 WPI Inflation 14-Months Ahead at Annual Rates

whelmingly as the CPI forecasts. One can still reject the hypothesis that these errors are random, this time on the basis of a tendency for the same types of error to occur sequentially, producing too few runs of positive and negative errors than are likely to occur just by chance. This, too, is consistent with the idea of cumulative adjustments as a result of gradual learning that the level of demand is not what it was expected to be.

Despite statistics that might show how poor these forecasts have been, I find them believable as reflecting informed opinion about price expectations at the time that the expectations are formed. This is discussed in more detail in Section 6 below.

5. Revisions of the Forecasts

This section is addressed to the question: To what extent are consensus forecasts of future levels of the CPI and WPI revised in light of recent errors in forecasting? At this point we are not investigating what determines the original forecast but instead are looking at one type of in-

formation that can be expected to have a major influence on changes in a forecast. We shall try to assess how strong that influence has been. The form of the relationship to be used was suggested by other studies of revisions of expectations, e.g., Meiselman (1962), Mincer (1969) and Hirsch and Lovell (1969).

To help illustrate the notation, imagine a December survey in which inflation forecasts from the preceding June survey are revised. Let π_6^*, π_{12}^*, π_{18}^* be the rates of inflation expected in June to prevail (at an annual rate) for the following 6, 12, and 18 months, respectively. With the Livingston data these were actually calculated over 8, 14, and 20 months, as explained in section 3, but we shall assume that the 8-month projections, for example, were meant to apply evenly over all eight months and hence at the same rate over the six months from April to October.

In these data there are therefore forward rates that can be calculated. There is an implicit expected rate of inflation from 6 to 12 months ahead, denoted $f1$, and from 12 to 18 months ahead, denoted $f2$. The formulas for computing these forward rates are

$$f1 = \frac{(1 + \pi_{12}^*)^2}{(1 + \pi_6^*)} - 1$$

$$f2 = \frac{(1 + \pi_{18}^*)^3}{(1 + \pi_{12}^*)^2} - 1$$

With data from a June survey, $f1$ is the rate of inflation forecasted for the period from October to April and $f2$ is for April to October of the following year.

Six months of data accumulate before the December survey, and the actual rate of inflation can be observed from April to October. If we call this π_6 then the most recent error in forecasting inflation is:

$$E = \pi_6 - \pi_6^*$$

New forecasts are made for the rate of inflation over the next six and twelve months. The new π_6^* is a revised forecast of the forward rate $f1$ from the preceding survey. Let the difference be denoted $R1$. We then postulate a regression relationship

$$R1 = a_1 + b_1 E + u_1 \tag{1}$$

where a_1 and b_1 are coefficients to be estimated and u_1 is assumed to be a random error. If $a_1 = 0$ and $b_1 = 1$, then the rate of inflation expected over the next six months has been fully adjusted for the most recent errors. If $b = 0$, then a predicted forward rate once formed is unaffected on average by recent forecasting errors. Data for equation (1) are available every six months.

There is also a revision in December of the longer forward rate $f2$

formulated in June. Let $R2$ be the resulting change in the forward rate of inflation expected for the period from the following April to October. Another regression equation:

$$R2 = a_2 + b_2 E + u_2 \tag{2}$$

can be estimated with data available only once a year because the 18 month projections were never requested in the December surveys.

Equations (1) and (2) have been estimated by ordinary least squares both with and without the constant terms. Only the results with the constant are reported in Table 4 since the main point, that revisions do not appear very sensitive to recent errors, emerges in either form. The constant terms are generally negative. This suggests a tendency to revise expected inflation rates downward in the absence of underestimation of inflation. Without the constant term, the estimates of the b_1 and b_2 coefficients are generally lower than those reported in Table 4.

With the CPI data every six months from 1953 to 1971 only about 6

TABLE 4

OLS Estimates Relating Revisions of Forward Expected Inflation Rates to Recent Errors in Forecasting.
(Standard Errors in Parentheses)

	Equation (1)		Equation (2)	
	a_1	b_1	a_2	b_2
CPI: With semi-annual observations:				
1953–71	−.160	.059		
	(0.93)	(.054)		
	−.097	.057		
1953–62	(.144)	(.079)		
1963–71	−.248	.075		
	(.116)	(.072)		
CPI: With annual observations:				
1953–71	−.433	.199	−.159	.180
	(.189)	(.100)	(.133)	(.070)
WPI: With semi-annual observations				
1953–71	−.105	.152		
	(.132)	(.066)		
1953–62	−.157	.119		
	(.214)	(.099)		
1963–71	−.060	.206		
	(.152)	(.084)		
WPI: With annual observations				
1953–71	−.289	.185	.098	.344
	(.193)	(.133)	(.129)	(.089)

percent of the forecasting errors appear to get into the revision of the shorter forward rate. The results are not much changed when the period is broken in the middle. There is not much greater sensitivity to forecasting errors with data from 1963 71. Slightly more sensitivity is indicated when the equations were estimated with annual data.

With the WPI data the b_1 coefficients are a bit higher, indicating that between 10 and 20 percent of the error in forecasting influences the revision of the forward inflation rate. The longer forward rate does appear notably more responsive to recent errors, in that b_2 is more than one-third.

These results are in substantial agreement with similar regressions run for revisions of levels of price forecasts that are not reported formally here. The forecast of a future CPI is apparently adjusted up by the full amount of a recent error but not by enough more to reflect much of a change in the expected rate of future inflation. The WPI forecasts were again somewhat more sensitive but far from fully responsive to errors in forecasting rates of inflation.

The relationship of these results to Livingston's adjustments of the consensus forecasts should be mentioned. If the consensus forecast is that the index will not change between October and November (or April and May), then clearly, from our estimates, the forecasts should be revised upwards by the full change in the index that month to reflect what respondents would have predicted. Since in most surveys during inflationary periods (when the adjustments are made) the forecasters surely anticipated some change over that month, we conclude that Livingston's adjustment is more in line with what he thought they should have predicted rather than what they would have predicted had they had the latest information. Perhaps we can say that he sensed the "inefficiency" in the forecasts and attempted partially to correct for it.

6. On the Rationality of the Forecasts

A challenge to the believability of these forecasts comes explicitly from Pesando (1975) and indirectly from the growing literature on rational expectations and efficient markets. Pesando uses Livingston's published forecasts of the CPI and, like most early users of the data, makes 6 month projections from the June and December values of the index. Thus, by his regressions and F-statistics, he claims to identify limitations of the Livingston price expectations data as used in earlier studies. This is surely a round-about way to criticize data that, as argued above, do not fully reflect the consensus of the respondents to the survey. The challenge, however, is too fundamental to dismiss on the grounds that the wrong data have been used.

Pesando's maintained (and hence not tested) hypothesis is that the

actual rate of inflation π_t over the six months from time t can be expressed as a linear function of rates of inflation in six-month intervals during the preceding two and a half years:

$$\pi_t = B_1\pi_{t-1} + B_2\pi_{t-2} + \cdots + B_5\pi_{t-5} + u_{1t} \tag{3}$$

Thus, according to Pesando, this fixed-coefficient linear distributed lag on past inflation rates is supposed to incorporate *all* of the information contained in realized rates of inflation. "Efficiency" requires that the expected rate of inflation over the next 6 months be approximately the same function of past rates of inflation. If the coefficients are significantly different from those estimated for (3), we are to reject the efficiency hypothesis. Similarly, "consistency" requires that the expected rate of inflation that was forecast 6 months earlier to hold over the next 6 months must again be the same function but with π_{t-1} replaced by its forecasted value at time $t-1$. "Full rationality" is the joint hypothesis that both efficiency and consistency hold.

Pesando's F ratios, indicating the significance of the improvement in fit from relaxing each of the hypotheses of equality of coefficients, are reproduced in Table 5 for the sample period 1959–69. He does not reject efficiency, probably because of Livingston's adjustments of the data. He does reject consistency and rationality.

The same tests show that even efficiency (as defined by Pesando) must be rejected when using our revised data for the expected inflation rates implied by the CPI forecasts. See Table 5. With the WPI data, *none* of the F-statistics are terribly large (at a 5% level of significance). The same respondents, with very few exceptions, predicted both the CPI and WPI. Are they "irrational" in one case and "rational" in the other? That hardly seems likely.

These F-tests are less revealing than a graphical look at the data, such as in Figures 1 to 4. In those diagrams one can see the times when and the

TABLE 5

F-Tests of the "Rationality" of the Livingston Price Expectations, Sample Period 1959–69

	Rationality	Efficiency	Consistency
From published data (Pesando's results)	3.48	1.31	20.75
From consensus CPI forecasts	5.87	8.00	4.82
From consensus WPI forecasts	.48	.26	1.55
Critical F-value at 5% significance level	2.02	2.49	2.49

extent to which price forecasts go astray. Systematic errors over a number of years do not mean that the forecasters are failing to make use of all available information *as they think it pertains to the future*.

There are several problems with Pesando's tests. One is that among all the possible relationships that might exist between past rates of inflation in different intervals of time, he has considered a very restrictive class. We shall return to that point subsequently.

Another problem is that a fixed coefficient model does not allow for changing relationships. He confines his tests to the period after 1959 because according to Gibson and Turnovsky, "an important structural break in the accuracy and impact of the Livingston price expectations occurred around 1959." If we accept this, then either something must have changed about the surveys or the participants started using information differently. There was no apparent change in the survey procedure and there was the usual high level of continuation of participants that marks these surveys. That leaves a change in the way that information was being used. If so, how justify a constant coefficient hypothesis? In effect, forecasts are supposed to bear the same relationship to immediately preceding inflation rates in 1959 right after the change allegedly took place as in 1969 with ten more years of observations.

One way around this problem is to re-estimate equation (3) every six months only with data available prior to the time of estimation. See, for example, Hess and Bicksler (1975). But then how many observations should each estimation go back? Too many and one may encompass changing relationships, e.g., during and after the Korean War. Too few and there will be only a few degrees of freedom.

We went back six years. With two observations per year this gives only 12 observations to estimate the five coefficients in equation (3), but we proceeded anyway. With the resulting estimates, the equation was used every half year to predict the rate of inflation for the following six months and, by repeated use of the equation, for twelve months. Whether we used CPI or WPI, the periods 1959-69 or 1959-75, or looked 6 months or 12 months ahead, eight comparisons in all, the Livingston forecasts always had a majority of the more accurate forecasts and in several comparisons more than twice as many as the regression forecasts. With one exception the Livingston data also always had the smaller mean square error.

It could be objected that we erred on the side of too few observations in the regressions. But how many should one try? We could hunt around for the "optimal" predictor, in terms of minimizing the mean square errors of the forecasts, by trying different lags, different numbers of observations, combinations of autoregressive, integrated, moving average predictors, a la Box and Jenkins (1970), and possibly non linear relationships. But all of that is allowing hindsight and is very likely introducing type-I errors (relationships that occur just by chance some proportion of the time).

An "optimal" predictor, once found, is often put forth as a standard for rational or efficient forecasts. The reasoning is that the survey forecasts, which presumably make use of information in addition to what is revealed by the past history of the variable being predicted, ought to do at least as well. There are several objections to the argument.

First, we often do not know how much searching has gone on prior to the reported comparison, either by the reporting investigator or, a fortiori, by others who were unable to find a better time-series forecast and never had their results published. See Feige (1975) on this point. Perhaps thousands of possibilities were tried before the standard for rational expectations emerged. This provides a bias toward good time-series predictors, one of which may well look better than a set of survey forecasts.

Second, the procedure itself is usually not guided by a theory of behavior or about the formation of expectations. Thus, there is little reason to believe that forecasters should have used the historical data in the way the eventual formula suggests, nor are there any clear guidelines to indicate how other information, not in the ex post formula, could have been used to improve on the time-series forecasts.

Third, the relationships are undoubtedly changing all the time, not just the number of years of data that should be taken into account but also the way in which the data should be utilized. Making decisions on the basis of patterns perceived in past data will usually change the patterns themselves.[5] This may seem to create a bias in favor of the survey forecasts, but it is not necessarily so. Knowledge that relationships are changing provides different forecasters with license to select different signals as relevant information. This gives rise to the well-documented phenomenon of divergent opinions about what is going to happen in the future.[6] A market outcome or an average survey result is of necessity a weighting of different beliefs, many of which will be wrong.

After the fact, information that seemed very important may turn out to be irrelevant. As Friedman (1968) and R. Gordon (1973) have both stressed, price forecasts right after World War II were influenced more by the behavior of prices following World War I (and earlier wars) than by price changes in the immediately preceding years. Thus, forecasts can be systematically in error for some time until people gradually realize that history is not going to repeat itself in particular respects. In the late 40's, a distributed lag on recent inflation rates would have outperformed the consensus forecasts.

The foregoing argument also suggests that looking for neat, robust, invariant formulas to characterize the formation of expectations may be a

[5]Gordon and Hynes (1970) use this sort of argument to claim that "results of research into lag structures may be of little use to the monetary authority."

[6]For an analysis of distributions of price forecasts, see Carlson (1975).

futile exercise. Two recent empirical studies illustrate the point. Carlson and Parkin (1975) use an inflation-expectations series constructed from Gallup Poll surveys in England. During periods of relatively mild inflation an autoregressive scheme, and during periods of high inflation an error-learning scheme, provide the best fits among the alternatives tried. De-Milner (1975), using data from Livingston's survey, demonstrates a response of forecasts to high errors that is significantly different from the response to low errors. If these are interpreted as new findings about responses to various conditions, the tentative and largely untested nature of the interpretations must be stressed. If they are read as evidence of a changing structure of expectations, one can only wonder when the next change will make the most recently estimated relationships obsolete.

Returning to the rational-expectations models, we should note that they have an important conditional point to make about policy. If people are in a position to act in their own best interests and if they can anticipate correctly how policy makers will react to specific conditions, then policy may become impotent. This is clearly articulated by Sargent and Wallace (1976). See also Lucas (1972). Over long enough periods, after learning takes place, these models pose a sobering challenge to the efficacy of macroeconomic policy proposals. It is much more dubious, however, to assert that the preconditions for these claims will be met while learning is taking place. Discernible, systematic patterns from which people can profit surely will not persist. The proponents of rational expectations and efficient markets go a step further and seem to be arguing that such patterns will not even exist.

When, as reported in Section 4, the consensus Livingston forecasts of inflation have errors that do not pass tests of randomness, this is a piece of evidence against a prediction of the extreme rational-expectations position.[7] One may perhaps legitimately question the validity of the data, but it is still one piece of evidence unless decisively discredited. I have no trouble accepting the responses to the Livingston surveys as representative of informed opinion about the state and direction of the economy in the near future, despite their strong tendency to underestimate the actual change in the CPI in recent years.[8]

Perhaps with enough data and the discerning eye and analytical skill of a mature economic historian, one might find relationships of sufficient

[7]Gordon (1976) raises some other questions about the predictions of these models.

[8]In replications of Lahiri's (1976) two-stage least-squares estimates with our revised data, the coefficients indicated that interest rates tend to rise by more than expected inflation, as Feldstein (1975) predicts within the context of a monetary growth model on the basis of tax effects. These results will be reported in a subsequent paper. They are mentioned here as possible support for the data. Also, when the Livingston inflation forecasts are used by Carlson (forthcoming) to construct a series of expected short-term real rates of return, the fall in these real returns during recessions is consistent with concurrent declines in the expected marginal productivity of capital.

generality to allow dispensing with direct data on expectations. In the meantime, we should certainly be extremely critical of expectations data gathered from surveys, continue to consider carefully how they can be used, and try to obtain the most useful measures. The reworking of the Livingston survey data on price forecasts, presented above, has been undertaken in this spirit.

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Appendix: Dispersion of Forecasts

This appendix includes two more tables showing a measure of the dispersion in the price forecasts of respondents to the Livingston surveys. Table A1 shows the standard deviations of the CPI forecasts whose means are recorded in Table 1. Similarly, Table A2 is the counterpart to Table 2 for the WPI forecasts. The standard deviations reported are the square root of $\Sigma(x_i - \bar{x})^2/n$ where x_i denotes an individual forecast, $\bar{x}$ is the sample mean, and n is the number of observations.

Two sets of statistics are reported in these tables. The first set measures the standard deviations of the actual forecasts. The second set is based on the implied individual forecasts of the rate of inflation. One of the advantages of the latter is that it does not depend on the level of the index.

A few observations can be made about these statistics. There was much greater divergence of opinion right after World War II than in more recent years. As would be expected, the dispersion reached its lowest levels in the early 1960's when the price indexes showed relatively little

change. It then built up again with the acceleration of inflation in the late 60's and early 70's.

The variance in the forecasts of the indexes are greater the farther into the future they are being projected, but, somewhat surprisingly, there is no evident increase in the variance of expected inflation rates as the forecasting horizon is extended from 6 to 12 to 18 months ahead.

TABLE A1

Survey Month t	CPI $t-2$	Sample Standard Deviations of Forecasts of CPI			Sample Standard Deviations of Expected Inflation Rates		
		6 Months Ahead	12 Months Ahead	18 Months Ahead	6 Months Ahead	12 Months Ahead	18 Months Ahead
Jun 47	156.2	5.73	8.62	8.28	5.36	4.79	3.30
Dec 47	163.8	7.90	10.72		7.26	5.61	
Jun 48	169.3	5.16	9.61	13.66	4.53	4.90	4.99
Dec 48	173.6	4.34	7.45		3.72	3.69	
Jun 49	169.7	4.86	5.84	7.00	4.18	2.98	2.57
Dec 49	168.5	3.02	4.62		2.67	2.36	
Jun 50	167.3	8.84	2.69	4.55	1.66	1.38	1.65
Dec 50	174.8	3.24	4.14		2.82	2.02	
Jun 51	184.6	3.23	5.65	7.88	2.65	2.62	2.54
Dec 51	187.4	2.39	5.17		1.93	2.36	
Jun 52	188.7	2.34	5.11	6.88	1.86	2.32	2.20
Dec 52	190.9	2.94	4.64		2.31	2.08	
Jun 53	190.1	1.65	3.80	5.66	1.30	1.72	1.80
Dec 53	115.4	1.49	2.39		1.92	1.78	
Jun 54	114.6	.96	1.76	2.59	1.25	1.32	1.36
Dec 54	114.5	.82	1.25		1.07	.94	
Jun 55	114.2	.63	1.16	1.85	.83	.87	.97
Dec 55	114.9	.82	1.49		1.07	1.11	
Jun 56	114.9	.71	1.64	2.06	.92	1.23	1.08
Dec 56	117.7	1.42	2.90		1.83	2.11	
Jun 57	119.3	.87	1.81	2.98	1.10	1.30	1.51
Dec 57	121.1	1.31	2.16		1.62	1.53	
Jun 58	123.5	.99	1.59	2.45	1.20	1.10	1.19
Dec 58	123.7	.53	1.14		.65	.79	
Jun 59	123.9	.87	1.07	1.65	1.05	.74	.79
Dec 59	125.5	.63	.95		.75	.65	
Jun 60	126.2	.56	.95	1.41	.66	.65	.67
Dec 60	127.3	.65	1.09		.77	.74	
Jun 61	127.5	.52	.95	1.49	.61	.64	.69
Dec 61	128.4	.50	.93		.59	.62	
Jun 62	105.2	.48	.90	1.28	.69	.73	.72
Dec 62	106.0	.48	.70		.68	.56	

TABLE A1 (*continued*)

Survey Month t	CPI $t-2$	Sample Standard Deviations of Forecasts of CPI			Sample Standard Deviations of Expected Inflation Rates		
		6 Months Ahead	12 Months Ahead	18 Months Ahead	6 Months Ahead	12 Months Ahead	18 Months Ahead
Jun 63	106.2	.37	.59	1.06	.53	.48	.59
Dec 63	107.2	.35	.59		.50	.47	
Jun 64	107.8	.49	.94	1.27	.68	.74	.70
Dec 64	108.5	.45	.66		.62	.52	
Jun 65	109.3	.44	.75	1.15	.61	.59	.62
Dec 65	110.4	.51	.76		.70	.59	
Jun 66	112.5	.80	1.28	1.93	1.08	.97	1.01
Dec 66	114.5	.95	1.51		1.26	1.13	
Jun 67	115.3	.62	1.13	1.73	.81	.84	.88
Dec 67	117.5	.76	1.37		.98	.99	
Jun 68	119.9	.81	1.22	1.74	1.03	.87	.85
Dec 68	122.9	.84	1.23		1.03	.86	
Jun 69	126.4	1.25	2.02	2.64	1.50	1.36	1.22
Dec 69	129.8	.94	1.29		1.10	.84	
Jun 70	134.0	1.44	2.13	2.74	1.63	1.35	1.20
Dec 70	137.4	1.01	1.51		1.12	.94	
Jun 71	120.2	1.11	1.63	2.11	1.41	1.15	1.02
Dec 71	122.4	.72	.99		.89	.69	
Jun 72	124.3	.82	1.26		1.00	.86	
Dec 72	126.6	.68	.98		.81	.66	
Jun 73	130.7	.99	1.87		1.15	1.22	
Dec 73	136.6	2.03	2.68		2.27	1.67	
Jun 74	143.9	2.22	3.36		2.36	1.98	
Dec 74	153.0	2.38	3.15		2.38	1.74	
Jun 75	158.6	2.16	2.45		2.08	1.31	
Dec 75	164.6	1.47	2.50		1.36	1.29	

TABLE A2

Survey Month t	WPI $t-2$	Sample Standard Deviations of Forecasts of WPI: 6 Months Ahead	12 Months Ahead	18 Months Ahead	Sample Standard Deviations of Expected Inflation Rates: 6 Months Ahead	12 Months Ahead	18 Months Ahead
Jun 47	147.7	7.43	11.70	12.00	7.18	6.91	5.15
Dec 47	158.5	9.87	13.73		9.27	7.45	
Jun 48	162.8	5.36	11.85	14.18	4.95	6.26	5.37
Dec 48	165.2	4.82	8.34		4.34	4.34	
Jun 49	156.9	4.44	6.98	8.08	4.13	3.86	3.20
Dec 49	152.2	3.80	4.88		3.74	2.77	
Jun 50	152.9	4.09	5.71	7.25	4.04	3.20	2.87
Dec 50	169.1	4.14	5.80		3.77	2.90	
Jun 51	183.6	4.68	7.63	10.76	3.82	3.56	3.50
Dec 51	178.1	4.34	7.71		3.67	3.70	
Jun 52	111.8	3.01	5.22	6.68	4.02	4.01	3.65
Dec 52	111.1	2.97	4.11		4.03	3.17	
Jun 53	109.4	2.73	4.14	5.29	3.66	3.27	2.97
Dec 53	110.2	2.40	3.86		3.22	3.02	
Jun 54	111.0	1.71	2.68	3.56	2.31	2.07	1.92
Dec 54	109.7	.94	1.66		1.29	1.30	
Jun 55	110.5	1.16	1.76	2.71	1.59	1.36	1.47
Dec 55	111.6	1.43	2.68		1.92	2.06	
Jun 56	113.6	1.53	2.60	3.45	2.02	1.96	1.83
Dec 56	115.6	1.96	3.18		2.55	2.35	
Jun 57	117.2	1.24	1.96	2.85	1.59	1.43	1.46
Dec 57	117.8	1.69	2.52		2.12	1.84	
Jun 58	119.3	1.17	2.14	3.13	1.47	1.54	1.57
Dec 58	119.0	.79	1.62		1.00	1.17	
Jun 59	120.0	.79	1.41	2.12	1.00	1.01	1.05
Dec 59	119.1	1.12	1.36		1.42	.98	
Jun 60	120.0	.78	1.22	1.77	.97	.87	.88
Dec 60	119.6	.80	1.40		1.01	1.00	
Jun 61	119.4	.85	1.21	1.63	1.07	.87	.81
Dec 61	118.7	.77	1.17		.98	.84	
Jun 62	100.4	.72	1.34	1.87	1.07	1.15	1.12
Dec 62	100.6	.52	.90		.78	.77	
Dec 63	99.7	.78	1.17	1.81	1.19	1.00	1.08
Dec 63	100.5	.64	.94		96	.80	
Jun 64	100.3	.47	1.01	1.28	.71	.86	.76
Dec 64	100.8	.53	.77		.79	.66	
Jun 65	101.7	.56	.92	1.31	.83	.77	.77
Dec 65	103.1	.58	.83		.85	.69	
Jun 66	105.5	.89	1.57	2.11	1.27	1.27	1.18
Dec 66	106.2	.99	1.90		1.40	1.53	

TABLE A2 (*Continued*)

Survey Month t	WPI $t-2$	Sample Standard Deviations			Sample Standard Deviations		
		6 Months Ahead	12 Months Ahead	18 Months Ahead	6 Months Ahead	12 Months Ahead	18 Months Ahead
Jun 67	105.3	.77	1.32	2.05	1.11	1.07	1.15
Dec 67	106.1	.96	1.64		1.37	1.32	
Jun 68	108.3	.82	1.25	1.66	1.15	.98	.91
Dec 68	109.1	.84	1.36		1.16	1.07	
Jun 69	111.9	1.26	1.84	2.29	1.71	1.40	1.49
Dec 69	114.0	84	1.37		1.12	1.03	
Jun 70	116.6	1.08	1.73	2.34	1.40	1.26	1.19
Dec 70	117.8	.98	1.35		1.26	.98	
Jun 71	113.3	1.25	1.73	2.65	1.67	1.30	1.37
Dec 71	114.4	.92	1.27		1.21	.94	
Jun 72	117.5	1.38	1.83		1.79	1.33	
Dec 72	120.0	1.35	1.70		1.72	1.20	
Jun 73	130.7	2.80	4.62		3.26	3.00	
Dec 73	139.5	4.20	5.60		4.62	3.40	
Jun 74	152.7	3.99	5.53		4.02	3.07	
Dec 74	170.2	5.19	8.07		4.68	4.02	
Jun 75	172.1	3.54	5.09		3.14	2.51	
Dec 75	178.9	2.65	4.59		2.27	2.18	