

SEASONAL EFFECTS IN THE REPORTING OF CONSUMER EXPENDITURES

Adriana R. Silberstein and Stuart Scott, BLS

Stuart Scott, 2 Massachusetts Ave, NE, Room 4915, Washington, DC 20212

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1. INTRODUCTION

The U.S. Consumer Expenditure Survey uses diary and interview components to collect expenditure data, with separate samples of households. Considerable effort is required on the part of respondents, who are to record weekly expenses in the Diary or to recall expenses for the previous three months in the Interview. The survey has a good response rate (85%), but experiences substantial underreporting. There is a long history of expenditure or budget surveys in many countries, covering both modes of collection. Collection effects are discussed most recently in Silberstein and Scott (1991), Redpath (1987), Nasholm, et al. (1989), and Rao and Vidwans (1989). Data from the survey are used for economic analysis and to provide the spending patterns, or quantity weights, for the Consumer Price Index (Jacobs, et al., 1989).

Comparisons between components, based on the overlap in coverage of expenditures, offer insights into the effects of collection mode on the data. The focus of this paper is differences in seasonal patterns, expanding the treatment in Silberstein and Scott (1991). Monthly means for Apparel expenses, shown in Table 1, diverge the most in November and December. The Diary, higher through the first ten months, has moderate increases in November and December, while the Interview experiences a major increase in December to exceed the Diary value. Retail sales data reflect heavy spending for the holidays, especially in December, which agrees more with the Interview pattern (U.S. Bureau of the Census, 1990). This anomaly in November and December is attributed to measurement errors in the data.

2. END-OF-YEAR EFFECTS

Monthly means for Apparel, Small Home Furnishings, and Entertainment expenditures, based on 1987-89 data, are displayed in Table 1. These are converted to ratios in Table 2 by dividing by the average monthly expenditure, separately for each component. These ratios are rough estimates of monthly effects, similar to seasonal factors from a seasonal adjustment. For each category, the Diary ratio increases in November and December, while the Interview ratio exhibits a very large increase in December.

Differences in the means are tested in a three-way ANOVA model, with collection mode, year, and month as factors. The model is computed using Hotelling T^2 statistics with contrast matrices, as described in Johnson and Wichern (1988, Chapter 6). This method conveniently tests for effects of interest, including the November-December effect, expressed by the contrast

$$(I_{Nov} - D_{Nov}) - (I_{Dec} - D_{Dec}).$$

The method also permits incorporating a covariance matrix for the means computed by balanced repeated replication to account for complex survey design effects, and does not require cell independence usually associated with ANOVA. Forty-four replicates are available from the survey design. With 27 degrees of freedom associated with fixed effects in the model, 17 remain associated with the error term. Additional interaction terms are not included in the model, to avoid using any more degrees of freedom.

Table 3 shows F ratios and p values from the model. Month is highly significant for all three categories. All three have end-of-the-year peaks, and some have one or more other months with high levels of spending. Mode is highly significant for Apparel and Entertainment, but only nominally for Small Home Furnishings. The direction of the mode effect is higher overall means in the Diary for Apparel and Small Home Furnishings, and lower for Entertainment. Year effects, which are significant but not strongly, could stem from inflation or changes in buying patterns. Our main interest is in the mode \times month interaction, decomposed into the November-December effect and residual effects. The November-December effect is strong for all three categories, with very little month \times mode interaction remaining. The test results justify studying further the end-of-year effects.

Various aspects of data collection may be sources of the differences by month. The Diary is designed to capture all expenses for two one week periods. Small and routine expenses, which would be hard to remember for long, are listed on the diary pages; these emphasize food purchases. Diary reporting in December may be affected by:

- (1) respondent time limitations and fatigue,
 - (2) interviewer time limitations,
 - (3) gift disclosure,
- and
- (4) space limitations.

Table 1. Monthly Expenditure Means (In Dollars)

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Apparel												
Diary	76	84	113	106	105	99	83	125	102	136	154	175
Interview	59	56	75	76	85	83	75	100	91	80	92	234
Small Home Furnishings												
Diary	23	23	28	32	55	26	26	34	39	30	43	53
Interview	22	24	24	31	38	30	28	28	24	25	30	57
Entertainment												
Diary	52	45	49	42	40	51	52	53	60	50	68	77
Interview	53	52	54	55	57	59	58	57	58	60	64	109

Table 2. Ratios of Monthly Means to Average Monthly Expenditures (× 100 percent)

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Apparel												
Diary	67	74	100	94	93	87	73	110	90	121	136	155
Interview	64	61	81	83	92	90	81	109	99	87	100	254
Small Home Furnishings												
Diary	66	67	81	93	161	75	77	100	114	89	125	154
Interview	73	80	80	104	126	101	93	92	79	84	99	189
Entertainment												
Diary	97	84	92	79	75	96	97	99	112	95	128	144
Interview	86	85	89	89	92	96	95	93	94	97	105	178

These factors can contribute to low Diary reporting in December. With regard to (1), Diary reporting drops off somewhat after the first day, possibly due to fatigue. This is shown in Silberstein and Scott (1991) and others (Kemsley, et al., 1980; Pearl, 1979). The decline in reporting after the first day may be exacerbated in December, a busy time for many households. As for (2), current survey procedures call for doubling the sample size during the last six weeks of the year in an attempt to capture increased spending. The added workload for the interviewers, often part-time employees, may adversely affect data collection. This may be especially true during diary pickup, when the interviewers help respondents recall expenses inadvertently missed. (3) As discussed in Section 4, the diarykeeper may elect not to enter gift purchases. (4) The emphasis on food in the diary page layout may adversely affect reporting of other expenses.

The Interview asks for expenses for the previous three months. This panel survey with four quarters of data for each household provides a picture of a family's spending for a 12-month period. An initial visit bounds purchases prior to the reference period. The long reference period increases the occurrence of major expenses, such as cars or major appliances, categories excluded from our analysis. Fatigue and time limitations are factors in reporting quality in the Interview. An interview typically lasts from one to three hours. Respondents are encouraged to refer to checkbooks, credit card bills, other records; an accordion folder for keeping receipts is routinely given to respondents.

There are significant declines in reporting from the first recall month to the third (Silberstein and Jacobs, 1989.). *Recall month* refers to the distance in time

from the actual interview. For example, an interview in early January asks for spending *since the first of October*; December counts as the first recall month, November the second, and October, the most distant in time, the third. The third recall month effect is alleviated somewhat by the collection of *current month data*. These refer to expenses for the interview month up to the day of the interview, later merged with the data for January collected in April as the third recall month.

November and December reporting in the Interview may be different from the rest of the year, for the following reasons:

- (1) improved recall related to holiday events and gift giving,
- (2) increased internal telescoping,
- (3) less activity in winter collection months, and
- (4) time limitations and fatigue.

The first three factors are advantageous to Interview reporting of December expenses. (1) Remembering purchases related to the holidays seems to fit the classic principle that anchoring to specific events enhances recall. (2) There may be some shifts from November to December in reporting expenses. The post-Thanksgiving weekend, considered to be the busiest shopping weekend of the year, always falls in November, but respondents may tend to assign purchases from that weekend to December, along with other holiday purchases. (3) There may be less pressure for interview time and, hence, better reporting, during the early months of the year. (4) The effects of fatigue or time limitations in December, already mentioned for the Diary, may lower November values, since December interviews provide some of the November data.

Table 3. F Statistics and p Values from Model for Means

	Apparel		Small Home Furnishings		Entertainment	
	F	p	F	p	F	p
Overall	44.5	0	11.4	0	23.5	0
Month	90.5	0	22.2	0	35.5	0
Mode	45.2	0	6.3	.02	41.2	0
Year	4.7	.02	3.8	.03	9.0	.0006
Mode×Year	1.0	.4	0.7	.5	0.3	.7
Mode×Month						
Nov-Dec	72.8	0	10.4	.002	41.8	0
Residual	2.6	.02	1.6	.2	2.2	.04

Note: A zero p-value means less than 10^{-4} .

3. RECALL MONTH EFFECTS

Interview reports for the same expenditure month are derived from three separate panels of respondents. December data, for instance, are reported as a first recall month by the panel interviewed in January, as a second recall month by the panel interviewed in February, and as a third recall month by the panel interviewed in March. Figure 1 presents monthly expenditure means by recall month of the Interview, labeled I1, I2, and I3, along with monthly expenditure means from the Diary. The first recall month and the Diary track each other fairly closely until December, although the Diary is higher for October and November. All recall months have major rises in December, and I2 is close to I1 for that month.

These relationships by recall month are displayed in Table 4 in the form of ratios, using the Diary as the base. This facilitates comparisons across months of the year. The declines in each row exhibit the recall effects reported in Silberstein and Jacobs (1989).

For Apparel, I1 means are close to the Diary most of the year, while I2 and I3 means are much lower. The pattern for December is quite different: a ratio above 1 for all three recall months, and well above 1 for recall months 1 and 2. The relationships in Small Home Furnishings and Entertainment are similar, but not as strong. For Entertainment, the ratios are almost always above 1, reflecting the Interview's higher overall means.

Internal telescoping cannot account for all of the end-of-year effects. Consider Apparel data reported by the panel interviewed in December. Since its respondents are interviewed in early December and for the most part likely to distinguish between November and December correctly, this panel should have little or no internal telescoping from November into December. Most of the December data are reported in March, when December is the third recall month. The ratio 1.1 for this panel is well above the

Figure 1. Apparel Diary Means (D) and Interview Means by Recall Month (I1, I2, I3)

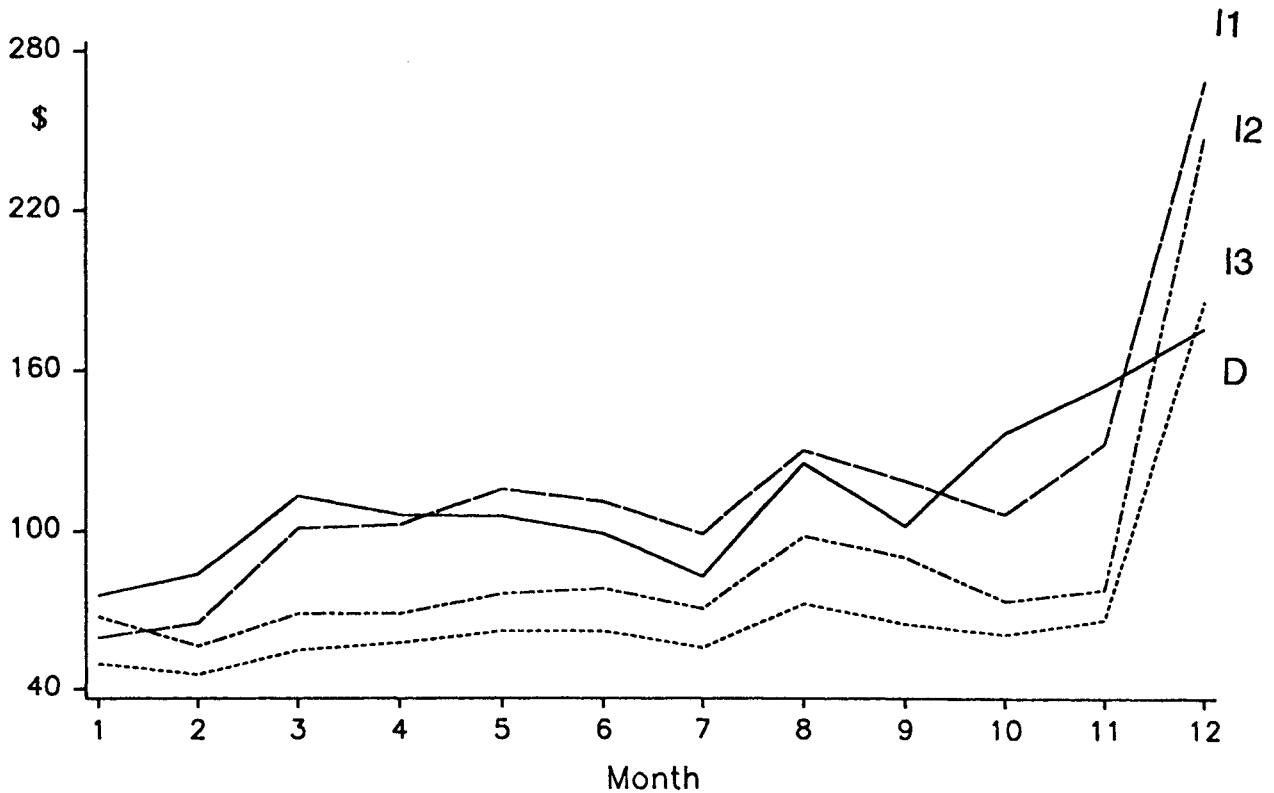


Table 4. Ratios of Interview Means by Recall Month to Diary Mean

		Recall Month			TOTAL
		1	2	3	
Apparel					
	Jan-Oct	1.0	0.7	0.6	0.8
	November	0.9	0.5	0.4	0.6
	December	1.5	1.4	1.1	1.3
Small Home Furnishings					
	Jan-Oct	1.1	0.8	0.7	0.9
	November	0.9	0.7	0.5	0.7
	December	1.2	1.1	0.9	1.1
Entertainment					
	Jan-Oct	1.2	1.1	1.1	1.1
	November	1.0	0.9	0.8	0.9
	December	1.6	1.5	1.3	1.4

Table 5. Ratios of Interview Mean to Diary Mean by Family Type

	FAMILY TYPE					TOTAL
	Husband-Wife Only	Husband-Wife, 1 or More Children	Single Parent, 1 or More Children	Single Person	Other	
% Consumer Units	22%	34%	6%	28%	10%	100%
Apparel						
	Jan-Oct	0.7	0.8	0.7	0.7	0.8
	November	0.6	0.7	0.6	0.6	0.6
	December	1.4	1.5	1.1	1.2	1.3
Small Home Furnishings						
	Jan-Oct	0.8	1.0	0.7	0.7	0.9
	November	0.5	0.9	0.9	1.0	0.7
	December	1.1	1.1	1.5	1.3	1.1
Entertainment						
	Jan-Oct	1.1	1.2	1.2	1.2	1.1
	November	0.9	0.9	1.6	1.1	0.9
	December	1.7	1.5	1.4	1.2	1.4

January-October recall month 3 ratio (0.6), so some of the other factors, e.g., memory of events, must be responsible. Some internal telescoping may be present for the panel interviewed in February. The December ratio (1.4), again greatly exceeds the January-October value for recall month 2. The November ratios for these panels are consistent with these interpretations.

While the patterns are simplest and strongest for Apparel, data for Small Home Furnishings and Entertainment also support effects other than internal telescoping. Overall, time limitations or fatigue effects in the Diary and better recall in the Interview for December appear as likely sources for most of the December effects.

4. DISCLOSURE EFFECTS

Another hypothesis for low Diary reporting in December is that the main diarykeeper may omit gift items to avoid disclosure to family recipients. Also, many gift purchases by other family members might remain unknown to the diarykeeper.

Reporting by family type is analyzed to evaluate possible disclosure effects. By survey definition, apparel purchases for persons outside the consumer unit count as *gifts* rather than Apparel; otherwise stated, each Apparel purchase must be associated with a member of the consumer unit. (The unit of analysis is the consumer unit, defined in U.S. Bureau of Labor Statistics, 1991). Thus, any disclosure effect should occur in consumer units with more than one person.

Table 5 shows I/D ratios by family type for totals (across all three recall months). As seen earlier, I/D ratios tend to be higher in December and lower in November than the rest of the year. The Apparel December ratios for consumer units with more than one member are greater than for single person consumer units. This is in the right direction for a disclosure effect. The ratios behave similarly for Entertainment, but the pattern is more mixed for Small Home Furnishings. Possibly, items in this last category are less personal and more subject to family discussion. Other factors, such as the Diary space limitations, could also explain these differences by family type.

5. CONCLUSIONS

Sizable end-of-year effects are found for Diary and Interview modes of reporting household spending. Expenditure means for December are higher than expected for the Interview and lower than expected for the Diary. Time limitations on Diary respondents and/or interviewers and better recall in the Interview

due to holiday associations seem the most plausible explanations for the end-of-year differences.

Further investigation into the causes of these effects is desirable. Our discussion of possible causes is speculative, since the evidence is indirect. A next step could be exploring these issues in the field with the interviewers or respondents. Focus groups or phone interviews, using cognitive principles, could be used to gain additional evidence.

The double sample for the Diary at the end of the year may not be effective. An analysis of more recent data will provide information on the effect of space on reporting of nonfood items, since the diary layout changed from two to six pages per day in 1991.

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