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STICKY PRICES: NEW EVIDENCE FROM RETAIL CATALOGS

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ABSTRACT

This paper presents new results on the size, frequency, and synchronization of price changes for twelve selected retail goods over the past 35 years. Three basic facts about the data are uncovered: first, nominal prices are typically fixed for more than one year although the time between changes is very irregular; second, prices change more often during periods of high overall inflation; third, when prices do change, the sizes of the changes are widely dispersed. Both "large" and "small" changes occur for the same item and the sizes of these changes do not closely depend on overall inflation.

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I. INTRODUCTION

Despite the central importance of the debate in macroeconomics over whether prices are flexible, there is very little direct evidence on how actual transaction prices evolve over time. For instance, in Gordon's [1990] recent survey of "New Keynesian Economics", he is only able to identify three time series studies on price flexibility. This paper contributes to the small empirical literature on price rigidity by describing the evolution of prices of twelve selected retail goods over the past 35 years.

The findings can be summarized in terms of the size, frequency and synchronization of price changes. I uncover three basic facts about these data: first, nominal prices are typically fixed for more than one year and the time between changes is very irregular; second, prices change more often during periods of high overall inflation; third, when prices do change, the sizes of the changes are widely dispersed. Both "large" and "small" changes occur for the same item and the sizes of these changes do not closely depend on overall inflation. These facts challenge many of the recent theories put forward to explain price rigidities and suggest certain directions in which to extend existing models.

The remainder of the paper is separated into five sections. In the next section, I explain why these data are particularly appropriate for testing many of the leading theories of price rigidity. In the following section, I describe the method of data collection and items in the study. The fourth section of the paper documents the facts mentioned above. The fifth section of the paper discusses how these facts bear on the leading theories of price setting. The final section summarizes my findings and suggests several promising directions for future research.

II The Relevance of Catalog Data

The data were collected from the mail-order catalogs of L.L. Bean, Inc., The Orvis Company, Inc., and Recreational Equipment, Inc. (REI). This section explains why catalog data are appropriate for testing many hypotheses about price rigidity.

A. Reasons Why Catalog Price Movements are Representative

The most obvious concern about these data is that by their very nature, prices advertised in catalogs might be suspected of being artificially more rigid than those in retail stores. Indeed, to be useful the prices appearing in any given catalog must be applicable over some non-trivial time horizon. Of course, this does not mean that the same nominal price must be operative at all times; it would be straightforward to index the prices in the catalog. As a practical matter, however, index prices are rarely used, at least in the U.S. Thus a key issue is how much is lost by studying the flexibility of catalog prices.

All three of the companies in this study fix their prices for six month intervals.[1] Consequently, a maximum of two price changes per year are possible for these data. There are several reasons that this restriction does not necessarily limit the relevance of these data. First, Rees [1961] has shown that aside from goods that are rapidly changing because of technological improvements, broad movements in catalog prices closely track price movements in conventional retail stores.[2] In fact for the six items in this study for which data are continuously available from 1953 to 1987, a regression of the cumulative change in catalog prices on the cumulative change in the Consumer Price Index (CPI) for all urban consumers yields a coefficient of 1.07 with a standard error of .10. So at low frequencies these prices provide a good indicator of general price movements.

Next, one must ask whether any useful information about higher frequency pricing patterns can be inferred from these data. Given that firms have the option of resetting the nominal price twice a year, there is information implicit in the decision not to reset the price. In other words, if catalog prices track general prices by always changing, but by a different amount each six months, then the semi-annual measurement would be particularly limiting. For all the items in this study there are sometimes long spells, say longer than four years, of fixed nominal prices, so the marketing considerations that seem to prevent very high frequency price revisions do not render these prices uninteresting -- particularly for students of business cycles.[3]

Furthermore, there is an offsetting feature of the mail order business that should work to make these prices potentially more flexible than other prices that are often studied. Most of the existing empirical work on prices focuses on intermediate goods transactions between buyers and sellers who have long-term relationships. Carlton [1986], in a careful study of such transactions, shows that these prices are quite sticky. As he points out, however, this need not imply any inefficiency because, in this situation, price is only one of the instruments which can be used to allocate goods. Blinder's [1991] survey results reinforce the view that this flexibility is important: survey participants often cite the ability to vary the nonprice attributes of a good as a reason for price rigidity. Since most of the goods in my sample are quite popular and have been carried by the companies for a long time, stock-outs are uncommon and delivery lags are not too variable. This suggests that prices may have to do more of the work in adjusting to clear these markets than in other situations. In this case, one might suspect that these prices might be more flexible than the prices involved in many other transactions.

On balance, it seems fair to conclude that although there are some idiosyncracies associated with catalog prices, in many respects these prices should be representative. More importantly, there are several specific attributes of the mail order business that make it ideal for studying the determinants of price rigidity.

B. The Specific Advantages of Catalog Prices

One useful aspect of catalog data is that they allow us to study a particular form of adjustment costs. Since putting together the layout of a catalog is costly, the catalog companies necessarily incur some expenses in making the price of their products known. By the time that the next catalog cycle starts, a firm will have to repay the fixed layout costs if it wants to change anything about a particular page in the catalog. These costs in no way depend on the size of any price changes that are made, so that costs of changing the posted prices are unrelated to the size of any price changes that are undertaken. This characteristic of the cataloging business is presumably the reason why Sheshinski and Weiss, in their classic 1977 article on price setting, motivate their model by describing the pricing problem facing a mail-order retailer.

Similarly, because catalog prices can be reset every six months, models emphasizing a fixed time period between price changes (e.g. Blanchard [1983]) also seem to be relevant. So these data should also be applicable for testing the performance of the type of fixed timing models that have often been suggested in the literature on price rigidity.

Another motivation for looking at catalog prices is that catalog sales are economically significant. According to Patterson [1994], United States mail order companies had total sales of fifty five billion dollars in 1993 and sales for 1994 were expected to grow by about seven percent. Additionally, since the items in this study are core business items for the firms, they all can be purchased in retail stores and for the most part are high volume items. Indeed the management of one of these companies regularly draws up a formal list of competitors which includes many non-mail-order firms and checks to see that their own prices are comparable to this reference group's prices.

Finally, by carefully selecting well-established, popular selling items that have undergone minimal quality changes it is possible to eliminate some of the noise in prices that might otherwise be present. For instance, by considering items that are representative of the firm's product line I can abstract from any pricing behavior that may occur when a firm is trying to break into a new market. Likewise, by studying large revenue items, I insure that firms have incentives to carefully scrutinize the prices. Also, by studying staple items that have undergone very little quality change, I can focus on pure pricing behavior.[4] Obviously, these considerations limit the number of goods that can be studied and the types of questions that can be analyzed. But, on balance, I believe these costs are significantly outweighed by the benefits of being able to study high quality data on transactions prices.

III. DATA COLLECTION AND DESCRIPTION

A. Data Collection

The prices were assembled by directly copying prices from old catalogs. I collected the information from Bean and Orvis, while the REI data were processed by a member of their staff. Although these companies issue many catalogs per year, the prices advertised in the Spring and Fall catalogs for each company effectively cover the next six months. If an item does not appear in a particular catalog, the last advertised price was used, which mirrors the policy of all three companies to sell an item at its last advertised price if it does not appear in the current catalog. The majority of the items studied appear in both the Spring and Fall catalogs each year, so that empirically this issue is not very important.[5] However, the Orvis fishing items are often advertised only in the Spring catalog, so that the duration between price changes for these items must be interpreted appropriately.

A second caveat is that the prices discussed below refer only to the list prices in the standard catalogs for one unit of an item. Hence, I ignore the very slight discounts for bulk purchases which have been offered occasionally by each of the companies. I also ignore sale prices which may have been available for very short periods. Each of the companies from time to time offers discounts if an item is over-stocked or a particular model is being discontinued. Similarly, each of these firms operate retail outlets where the goods in the catalogs can be purchased in person at the catalog prices.[6] Again, the retail outlets sometimes offer short-lived sales that are not available to catalog customers. For the items in this study, sales are very infrequent.

In using only stated catalog prices I am also ignoring any postage and handling charges. This can be justified for at least three reasons. First, during my sample period all Bean prices include these charges and the Bean prices can be used to establish essentially all of the claims made below. Second, the Orvis and REI prices also apply for goods bought through their retail stores and as such, do represent transaction prices for some customers. Lastly, Bean management reports that numerous customer surveys have indicated that most customers are insensitive to shipping charges. This last claim would be interesting to document and study for its own sake, but it is beyond the scope of this paper.[7]

REI is a consumer cooperative, so once per year REI members are given rebates for purchases made in the preceding year. The last implication of using stated catalog prices in my calculations is that I ignore any rebates that members may subsequently receive for buying through REI. Since non-members do not receive the rebate and the patterns for the REI data are similar to the Bean and Orvis data, I do not think the presence of the rebates causes any significant biases.

B. Data Description

The L.L. Bean products include two shoes, a shirt, a blanket and a duffel bag. Together these items cover Bean's traditional product areas: footwear, clothing, hunting and fishing gear and hand-sewn canvas and leather specialty items. Of the two shoes, one is a moccasin and the other a hunting boot. The shirt is a cotton "chamois" shirt. The duffel bag is made from canvas and the blanket is made of wool. Bean manufactures the duffel bag and the shoes. The chamois shirts are contracted out and the manufacturer changes from time to time. The blanket is a Hudson's Bay Blanket that Bean imports from England. All of these items are studied over the entire 1953-1987 period.[8] (A more complete description of the data is given in the appendix of the 1990 working paper version of the paper.)

The items I track from Orvis reflect the fact that it began as a fishing tackle supplier and has expanded over the last 25 years to now offer a wider variety of products. The earliest Orvis items are a bamboo fly rod and a fly. Both are individually made, although the fly-tying is contracted out and the bamboo rods are made in-house by Orvis craftsmen. The popularity of the bamboo rod declined with the invention of graphite, and the rod was discontinued in 1985. The fly is available over the entire 1953-1987 period.[9] I also analyze the prices of a poplin fishing hat that Orvis has sold since 1963.

The non-fishing items have a shorter lifetime. The hunting item that I follow is a pair of binoculars which Orvis sold from 1966 until 1986. After 1986 the case for these binoculars was changed, so I dropped the item. The binoculars are made for Orvis in West Germany. The last two Orvis items were selected because of their comparability with Bean goods. I track the Orvis chamois shirt, which the company introduced in 1974 and the Hudson's Bay Blanket during the twelve years that Orvis carried it (1972 through 1984). The Orvis and Bean chamois shirts are close substitutes for each other and the Hudson's Bay Blankets that the two companies offered were identical.

The data from REI were restricted by the availability of past catalogs. Complete catalogs prior to 1969 were not available. Given that less than 20 years of data were available, I chose to use only one REI item: the REI chamois shirt. This shirt is manufactured for REI and is very similar to the Bean and Orvis shirts.

The products studied are generally well-known, standard items. Given the range of goods studied, there are bound to be some differences in demand variation and cost fluctuations, but in many cases these differences can be used to study the implications of different theories. More importantly, there do not appear to be any strong reasons to believe that goods' prices should move in unrepresentative ways.

IV. NOMINAL PRICE CHARACTERISTICS

A. Frequency of Price Changes

Table I introduces the mnemonics used throughout the remainder of the paper and presents the first main finding: that nominal prices typically stay fixed for periods of longer than one year -- the actual price data are tabulated in the data appendix. As mentioned in the last section, it is the nature of the catalog business that prices listed in a catalog do not expire immediately. But there is no a priori reason why price schedules could not be included in the catalogs. In principle, the schedule could depend on time or more exotic factors such as the consumer price index. Similarly, the companies could issue catalogs with prices that expired more frequently (say every three months). However, given conventions followed by these firms, this fact should be interpreted as saying that over half the time when the firms consider adjusting their price they choose to leave it alone.

When studying the durations shown in Table I it is important to remember that the Orvis Fishing Hat and Light Cahill Fly are often only advertised once per year. More generally, all the durations depend (slightly) on the way that the truncation associated with the end of the sample is handled. The statistics on the time between price changes that I report were calculated using the conservative assumption that all prices prevailing in Fall 1987 would change in the Spring 1988.[10] Even so, the average time between price changes is about 15 months.

The last four columns in Table I provide further information on the duration of long spells. These columns reveal that none of the items had their longest spell during the mid- to late-1970's. This is the first of many indicators that will show that during times of higher inflation long spells of constant prices are less common. The table shows that long spells have not disappeared. Periods of more than two years of constant prices still occur.

B. The Size of Price Changes

The two panels in Figure I give a variety of statistics concerning the size of price changes. For each item, the top panel shows the average (absolute) size of the price changes. The lower panel provides information on the distribution of the size of the changes. For example, for the Orvis binoculars roughly five percent of the changes were less than one percent in magnitude, while roughly 14 percent were between one and two percent and another 14 percent were between two and three percent. Thus, about one third of all of the changes were less than three percent in magnitude. Conversely, about one fifth of the changes for the Orvis binoculars were more than 15 percent in magnitude.

Overall the heterogeneity in the size of the changes, both across time and items, is striking. As the top portion of the Figure shows, the mean change for the different items varies between 4 and 18 percent, while the average over all items is about 8 percent. However, as the bottom panel shows there are both large and small changes for the same item at different times. The last bar in the lower half of the figure shows that across all items, 2.7 percent of the changes are less than one percent in magnitude. Another 7.2 percent are between one and two percent, while 11.1 percent are between two and three percent, so that a total of 21 percent of the changes are less than three percent in absolute value. Yet, more than 13 percent of the total changes were more than 15 percent in magnitude.

The size of the individual price changes is not very closely tied to the overall (observed) level of inflation: changes are more frequent during the 1970s but not systematically larger when compared to the 1950s, 1960s or late 1980s. One way to demonstrate this point is to compare the average price change during the 1968 to 1982 period, when inflation in consumer prices averaged about 7.5 percent per year, with the average size of the changes over the pre-1968 and post-1982 period, when average inflation was about 2.5 percent. These statistics are shown in the fifth and sixth columns in Table II. The numbers in parentheses below each of the entries in the table represent the number of changes included in the averages.

For the items that entered the study in the late sixties and early seventies, there is clearly limited information available concerning pricing patterns in a low-inflation environment. Nevertheless, the table demonstrates that the average magnitude of the price changes between the two periods is approximately equal. A formal Wilcoxon ranks test for equality of the median change between the two periods confirms this claim. (I use a non-parametric test since the distribution of price changes appears to be very non-normal.) The last column of Table II shows the probability that the median change in the two periods is equal. For none of the items is it possible to reject the assumption of equality at any of the usual significance levels. For the joint test that the median change across all goods is equal in the two periods, I fail to reject at the 75 percent significance level.

A different way to see the importance of the variation in the size of the price changes is to directly compare the price movements to changes in aggregate inflation. The top half of Figure II shows a scatter plot of changes in the catalog prices and changes in the Consumer Price Index. For reference, a regression line is also shown. The slope coefficient in the regression is estimated to be 0.82 (with a standard error of 0.14), although this coefficient estimate is strongly influenced by the four large price changes. Absent these four changes of more than thirty five percent, the slope is estimated to be .68 (with a standard error of .11), so that one would reject the hypothesis that the coefficient relating the two measures of price movements is equal to one. In either case, however, the R^2 from the regression is around .05, so that the actual correspondence is very loose.

The lower half of the figure makes a related point by comparing catalog price changes to movements in the monetary base. Since the money aggregates are not available prior to 1959, this plot excludes the earliest part of the sample, but even so, the fitted regression line shows that there is significant positive association between movements in catalog prices and a narrow measure of money -- the slope of the regression line is estimated to be 0.71 (with a standard error of 0.24). Again, however, the R^2 for the equation is very low (.015), so that the growth in money has relatively little explanatory power for the catalog prices. Put differently, the purchasing power of money would vary significantly over time because prices do not closely covary with the amount of money.[11]

Finally, as is evident from these figures, about eight percent of the price changes (21 of the 261) are negative. Perhaps surprisingly, none of the basic facts about the price changes appear to be driven by the presence of the price cuts. In particular, the prevalence of the small changes is not due to price cuts -- more than 20 percent of the price <u>increases</u> are less than three percent. More generally, the average size of the price cuts and price increases are not noticeably different: the average size of the increases is 8.2 percent, while the average price cut is 7.4 percent.

C. The Synchronization of Price Changes

Since some theoretical models make predictions regarding the comovements in prices, I next study the extent to which changes across items are synchronized. Figure III shows the timing of price changes. Each symbol in the figure marks the periods when a price changed. The figure highlights the fact that price changes were much more frequent from the late sixties to early eighties; during periods of higher average inflation, price changes were more common.

The shading in the graph shows periods designated as recessions by the National Bureau of Economic Research. A first indication of the lack of synchronization of the price changes is that the frequency of price changes does not appear to depend on the stage of the business cycle. Price changes occur about 30 percent of the time during business cycle expansions and about 34 percent of the time during business cycle contractions.

It is difficult to more precisely characterize the synchronization of the changes because, given the discrete nature of changes, standard correlation statistics are uninformative. Accordingly, I use a measure of association that accounts for this discontinuity (see Fleiss [1973] pp. 42-43). Intuitively, this association measure is derived by checking whether changes and non-changes for one series are sufficiently aligned with changes and non-changes for the second series so as to reject the hypothesis that the two sequences of changes are independent. Therefore, in addition to providing a measure of association that is scaled between -1 and 1, the statistic also facilitates testing whether price changes for any pair of series are independent. I view lack of independence as a very weak benchmark since with semi-annual data I would expect business cycle factors to induce some common movements across most items.

Surprisingly, using the changes of the raw, semi-annual data it is not possible to reject the hypothesis of independence among most of the series--only 12 of the 66 pairwise comparisons were sufficiently correlated so that the hypothesis of independence could be rejected. (To save space these results are omitted). One possible explanation for this may be that changes are indeed synchronized but not contemporaneously timed; for instance, changes for similar items may regularly occur within a year but not coincide exactly. Moreover, for some of the more seasonal goods, comparisons using semi-annual data may be slightly misleading.

To investigate these possibilities, I annualized the data so that changes that occur within the same year will be treated as identical (i.e., if any price change occurred within a given year, the observation for the year is coded as a one, otherwise it is coded as zero.) Since there are two ways to group adjacent Fall and Spring seasons, I used two different definitions of a year: one corresponding to the standard calendar year, the other corresponding to the fashion cycle that runs from Fall of one year through Spring of the next year. Using the calendar year convention there are nine significant associations between the 66 pairwise comparisons, while there are only six significant associations using the fashion year dating.

In some cases, the short length of the sample and the associated lack of precision may be responsible for the insignificance of the correlations. However, the lack of synchronization is also evident for many of the items where synchronization might have been most expected. For example, one cannot reject the hypothesis that the price changes for the identical blankets being sold by Orvis and Bean are independent. The same conclusion follows for the associations among the three chamois shirts and for the connections between the fishing gear. Collectively, these results suggest that there is very little synchronization between the price changes across items.[12]

At this point I have established the three main facts mentioned in the introduction: prices are adjusted infrequently, by differing amounts, and, although prices are more likely to change during periods of high overall inflation, the synchronization of changes across goods is generally low. These findings should not be surprising since they are implicit in the only other empirical work using U. S. data, Cecchetti [1985, 1986]--although Cecchetti did not emphasize the presence of many small changes.[13] His results are for magazine newsstand prices, which some skeptics have argued may be atypical because subscriptions and advertising, not newsstand sales, produce the majority of magazine revenue and magazines on the whole are a small ticket item. My data are immune to these criticisms and reaffirm Cecchetti's findings.[14]

V. INTERPRETING THE FACTS USING EXISTING MODELS

One difficulty in trying to explain these facts is that there is no consensus, baseline model from which to start. Instead the literature has bifurcated so that most papers focus either on time-dependent price-setting rules or state-dependent price- setting rules.

Unfortunately, neither of these lines of the literature convincingly explains the failure of firms to index their prices.[15] The standard reply to concerns over why sophisticated rules are not used is that the cost to a monopolistically competitive firm of a slightly miss-set price is second-order (see Mankiw [1985] and Akerlof and Yellen [1985].) So, if there are small relabelling or "menu" costs involved in revising prices they may be enough to inhibit continuous adjustment of prices. While this explanation is appealing, the difficulty of identifying these menu costs (or in Akerlof and Yellen's terms, explaining why nominal rules of thumb dominate simple indexing schemes) is still disturbing. Both time dependent and state dependent models are therefore incomplete, but both approaches can explain why other types of pricing decisions are not made continuously.

A. Assessing Time-Dependent Pricing Models

One class of explanations for why prices are not continuously reset presumes that either the necessary information is not available or that the costs of high frequency changes are prohibitive (see Blanchard [1983].) These models posit instead that price setters will intervene to change prices only occasionally when the relevant information has become available. This argument is somewhat appealing because these companies are now issuing so many catalogs per year (Bean was sending out over 20 per year by the end of the sample) that it would be unrealistic to assume that prices could be intelligently readjusted with each catalog. Aside from the confusion it would create for customers, it is probably difficult to process sales data quickly enough to justify continually fine-tuning prices. Although this model explains why prices are posted for non-trivial periods of time, it does not explain why the actual period of time between changes for the same good is so variable. The large standard deviations for the number of months between price changes cannot be explained by simple timing models.

A more sophisticated timing-based model would relax the assumption that all prices for every item are revised in tandem. Instead, an extended model would focus on the extent to which price changes could be related to the (potentially lumpy) arrival of information. In particular, a robust implication of the timing model is that if two items have similar cost or demand characteristics, so that information arrival for the goods is highly correlated, then price changes for the two items should be correlated. In my sample there are four natural groupings of items where these conditions are likely to hold: the two identical blankets, the three nearly identical shirts, the two types of leather shoes, and the three fishing items. As mentioned in the last section, it does not appear that changes among these goods are tightly synchronized even at the annual frequency. Only for the two types of shoes is it possible to reject the hypothesis that the price changes are independent.

The asynchronization of the changes is even more surprising given that the price levels for comparable items tend to be aligned. For instance, the Orvis price-setters told me that they were matching Bean's price moves for the Hudson Bay blankets. While it is true that the price levels are fairly close, a comparison of the sequence of price changes turns up some unexpected patterns. For instance, between the Spring of 1980 and the Fall of 1982, the prices for the blankets were:

	1980		1981		1982	
	Spring	Fall	Spring	Fall	Spring	Fall
Bean	\$110	\$111	\$112	\$131	\$132	\$145
Orvis	\$110	\$110	\$131	\$136	\$136	\$136

After the Fall of 1982, the Bean price remained at \$145 for another 18 months, while Orvis held its price at \$136 for another two years. Clearly this sequence of changes will be difficult to explain using a standard timing model. More generally, aside from the fact that prices sometimes do not change, I find little support for the timing models.

B. Assessing State-Dependent Pricing Models

The leading alternative explanation for why firms do not continuously adjust prices posits that, because price adjustment is costly, a firm trades off the costs of letting inflation erode its optimal price with the cost of changing prices. With a fixed cost of changing prices and a predictable amount of inflation, the firm will not adjust its nominal prices until the accumulated inflation drives the real price below a (pre-specified) lower limit. Once the limit is crossed, the nominal price will be reset to a higher level. Allowing for cost and demand shocks implies that nominal prices should be set to be keep the real price within a band that varies over time.

The usual motivation for these type of models is that they are plausible and sometimes even optimal (depending on the exact specification of the model). Not surprisingly, as with the simple timing models, the versions of this model that rely on a constant fixed cost of changing prices fail to describe many key features of the data. For instance, not only do nominal prices both rise and fall, but the presence of many small price increases suggests that the band widths are highly variable. Similarly, as Tsiddon [1991] shows, when expected inflation increases, the average size of price changes should increase because a firm would want to trade off the frequency of costly price changes with the deviation of the actual price from the target price. As shown in Table II, there is no evidence that the size of prices is closely related to the level of inflation.

There are several ways to extend the state-dependent models that would help address these problems. One possibility is to assume that demand conditions shift to make the desired band width narrower, so that an immediate small price change has a large benefit. Alternatively, the variations in the sizes of the price changes could be handled by introducing a time-varying cost to changing prices.

These approaches are just beginning to be pursued. For instance, Benabou [1992], expanding on his 1988 model, shows how consumers' search behavior can interact with the level of inflation to generate endogenous fluctuations in the degree of competitiveness. In his model, shocks that increase competition decrease price dispersion and thus can generate a motive for small price adjustments, even at high levels of inflation. Unfortunately, the Benabou model is sufficiently complex that it can only be analyzed using simulations; "testing" the model does not seem possible at this point.

Caballero and Engel [1994] propose a related set of models, including one where the cost of changing prices is explicitly modelled as a random variable. In this case, a Sheshinski and Weiss style policy, in which firms take no action until a threshold is crossed and then act for sure once the barrier is passed, is no longer optimal. Instead, firms will have a continuous probability of adjusting their prices and the probability of adjusting will rise as the distance between the optimal price and the actual price increases. Intuitively, this type of policy will generate both large and small changes because if the costs of changing prices are sometimes low, then firms will occasionally make a small price adjustment.

The principal implication of this class of models is that large divergences between the actual price and the desired price are much less likely to be optimal than small divergences. Accordingly, shocks that engender large divergences will generally be offset by price changes, so that large price changes should be more common than small adjustments -- the distribution of price changes should be fat-tailed.

The (excess) kurtosis of the price changes in this sample is 31.02. Interestingly, the kurtosis of the price increases is 31.23, while the kurtosis of the price cuts is 4.58. These differences are also predicted by the theory since the general drift in inflation should make large price cuts less necessary than large price increases. Thus, simple calculations suggest that this new class of models is very promising.

C. Assessing a New Customer-Based Model of Pricing

The last explanation I consider was proposed by the price-setters at Orvis and REI. They suggested that there are certain nominal thresholds, "price points", which firms are reluctant to exceed because doing so would lead to a considerable loss in sales. More formally, a price point is a price where a firm believes its marginal revenue curve is discontinuous because its customers care about nominal magnitudes. This explanation is different from the standard kinked demand explanation of price stickiness. The firm may be reluctant to exceed a threshold even if there is no strong competition. For instance, for a monopolist, a price increase from 19.95 to 20.30 might have a very different effect than an increase from 20.50 to 20.85. The presence of a competitor is likely only to reinforce a firm's reluctance to change a price.

There is no tight theoretical justification for this story, although it is essentially similar to the explanation for rigidities posited by McCallum [1986]. McCallum suggested that the use of non-indexed prices is done for convenience. He argues that inflation uncertainty in the United States has generally been low, so that the gains from indexation would be low enough that the mere cost of continually calculating real prices is sufficient to deter firms from indexing. The analogy is that buyers may use rules of thumb when searching for items and comparing prices. McCallum's convenience argument can be used to explain why the rules would likely be formulated using nominal prices. If firms are aware of this tendency by consumers they may set prices so as to exploit the use of the rules; if a firm knows some customers do not even consider buying a shirt that costs more than $20, then the firm will prefer to charge $19.95 instead of $20.05.

The REI and Orvis price setters do not appear to be the only retail firms that believe that price points are important. For instance, in his recent survey of firms pricing behavior Alan Blinder asked firms to assess the importance of this phenomena. Among the seventeen retail firms he sampled, the price point theory received considerable support. For instance, fifteen of the seventeen firms report that they believe their customers are affected by price points.

Thus, the natural question is whether standard statistical tests can be used to determine their relevance for price rigidity. In a previous version of the paper, Kashyap [1990], I provided a number of calculations to assess this question. The results were mixed and for brevity's sake, I merely summarize the main findings. First, the static distribution of prices is not uniform. Prices ending between 41 to 50 cents or 75 to 00 cents are much more common than prices ending between 01 to 40 or 51 to 74. (This is a widely documented finding, see Friedman [1967].) The bunching of price endings is more pronounced during low inflation periods than high inflation periods. These facts about the static distribution, however, are irrelevant for macroeconomists unless they have dynamic implications.

To investigate the dynamic consequences of the price points, one needs to be more specific about how to define a price point. This is difficult since there is clear danger of circularity in using the data to learn about the price points and then testing the model with the same data. Ideally, one would use different data sets to identify the price points and to study their consequences. With only one data set and a presumption that the high and low inflation periods may differ, the options here are limited. My approach was to use very simple rules to identify the price points, with the hope that these rules were sufficiently straightforward that it would be clear that the results have not been rigged.

The rules I adopted create thresholds every fifty cents for the low price items (the hat and the shoe) and every dollar for the more expensive items.[16] Operationally, this meant that prices in certain ranges were considered to be at price points. The dollar price point encompasses only those prices that end between 75 and 100 cents. The fifty cent price range was defined to include this range as well as prices which end between 40 and 50 cents. For instance, prices of $12.45 and $7.95 would both considered to be at a fifty cent threshold. Given these admittedly ad hoc cutoffs several tests were carried out. (See Kashyap [1990] for a more extended discussion of what follows).

First, if pricing points inhibit price changes, then they might also be expected to affect the sizes of price increases. Specifically, if prices that are at price points are fixed longer than other prices, then any subsequent price adjustments might be expected to be larger than average. There was weak evidence in this direction. On an item by item basis there was a slight tendency for the changes after price points to be larger (but not significantly so) than usual. Collectively, across all items this pattern was statistically significant.

A more direct test I considered was to check whether after controlling for competitors' price movements and cost shocks, price changes were less likely to occur when prices were near price points. To do this, I estimated the probability of a price change given proxies for cost changes and movements in competitors' prices, as well as an indicator of whether the firm was near a price point.

The models successfully predict the decision to change or not roughly 70 percent of the time. The coefficients on the cost proxies tended to be positive and marginally significant, indicating that an increase in costs increases the likelihood of a price change. Conversely, for seven of the eight items, the price points indicators have negative coefficients -- although only one of the eight coefficients had a t-statistic greater than 1.67 in absolute value (the ten percent significance level) . The cumulative increases in the price of substitute goods, over the period when a firm has its own price fixed, seemed to have a mixed effect on the likelihood of a price change--with the only significant results coming for the shirts. Thus, although the price points seemed to work in the expected direction most of the coefficient estimates were insignificant.

This conclusion was partially reversed when I allowed the importance of the price point effects to shift with the level of inflation. Specifically, I split up the price threshold proxy so that there were separate regressors for the high and low inflation regimes.[17] The period 1968-1982 was chosen as the high inflation period (and the results were not sensitive to use of these specific dates). The results were then somewhat more impressive: for all of the goods, being near a price point in the low inflation period reduced the probability of a price change, while in most cases price points were of no importance during the high inflation period. Furthermore, the importance of the price points was much more pronounced for the shirts, cap and fly -- the coefficients on the price point indicators during low inflation periods for four of these five items had t-statistics above 1.5. It appears that the designation of price points that I used for the three $40+ items was too loose. The data suggest that adjacent one dollar barriers are not nearly as important for these more expensive items.

The overall evidence on price points suggests that they may influence price adjustment, but this data set is not very well suited to establishing their importance. A study focusing on more goods even over a much shorter period would have much more power to determine the significance of the price points.

VI. CONCLUSIONS

The results in section IV show that nominal prices sometimes stay fixed for several years and at other times change regularly every six months. When prices do change, the size of the price changes are quite different and in particular, small price changes are quite common. The combination of many periods of no change and many small changes suggests that when small price changes do occur, the costs of changing prices must be small (or the benefits of the change must be large). At other times these costs must be larger or benefits must be smaller. Models that generate price rigidity by assuming a constant cost of changing prices in an otherwise stationary environment cannot explain these data.

Models that assume that the costs of changing prices are time varying may be able to explain these data. While these models are becoming easier to work with, they do not explain why these costs exist in the first place. Is this an important question? Ball and Mankiw [1994] have recently argued that macroeconomists should not be too worried about using "menu cost models without having a literal account of menu costs." I disagree. For instance, a leading explanation for the true costs of adjustment is the cost of managers' time (e.g. Ball and Mankiw). If this is correct, automated pricing decisions should become much more common with increased computerization. It is quite possible that automatic indexing provisions will gain popularity. It is important to determine whether such changes will have a large impact on the extent to which prices are sticky. More generally, there was one episode in my sample -- the late 1970s -- when catalog companies significantly increased the frequency of their prices changes. Without knowing what led to this shift, the robustness of the shortcuts that must be taken to keep models tractable seems questionable.

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1. One interesting question that I do not study is why the companies choose this particular interval over which to quote fixed nominal prices.

2. Specifically, he shows that a consumer price index based on a collection of catalog items closely tracks the Bureau of Labor Statistics' official consumer price index, as long as the goods are not undergoing big changes in quality.

3. See Barsky and Warner [1994] for a study of high frequency pricing patterns.

4. Of course not changing quality may be an endogenous decision. Implicitly I assume that for these goods, quality changes are driven by exogenous forces.

5. If a customer uses an old catalog to place an order, all three companies fill the order and bill the customer for the current price.

6. The equivalence between the store and catalog prices is reassuring since Orvis and REI are expanding the number of outlets they operate and thus the percentage of total sales accruing from catalogs is falling. At the end of my sample, mail order sales accounted for over 80 percent of Bean's and Orvis's total sales and roughly 20 percent of REI's total sales.

7. In the early 1990s Bean changed its policy and began adding a shipping charge.

8. The price of each of these items except the duffle bag changed in the first half of 1953 -- the duffle bag price had been at $7.85 since the first half of 1951. I limit my analysis to the post-Korean war period because of the price controls and rationing that prevailed during the Korean War and World War II. In many cases, goods completely disappeared from the market. In other cases, quantities were limited and often only available if the buyer had a ration coupon.

9. Unlike the bamboo rod, the fly's price did not change in the first half of 1953. So in Table 1, I account for the fact that the price of the fly was 42 cents from 1949 through the Spring of 1954.

10. Dropping the last spell for each item gives very similar answers -- except for the Orvis chamois shirt which had not had a price change since the second half of 1983.

11. The link between money and prices is even looser if one uses M2 as the measure of money. In this case, the regression line has a slope of .01 (with a standard error of .18) and R^2 for the regression is only .00001.

12. Lach and Tsiddon [1992] report that price changes across a set of grocery goods in Israel between 1978 and 1984 are not very closely synchronized. Tommasi [1993] also reaches this conclusion after studying weekly supermarket prices of 15 goods in Argentina in 1990. So even across very different inflation regimes there seems to be little synchronization of price changes.

13. Danziger [1987] analyzes Israeli data for Kosher salami. However, his data are not continuously sampled through time or across sellers. Sheshinski, Tishler and Weiss [1981] study the price of noodles and instant coffee in Israel but these prices are regulated. Lach and Tsiddon [1992] and Tommasi [1993] examine prices from economies with much higher rates of inflation than the United States. Barsky and Warner [1994] have recently collected daily transactions prices for a number of retail goods sold at several stores, but their sample covers only a few months.

14. See Weiss [1993] for a comprehensive survey of how these findings compare to results from studies using data from other countries.

15. As Ball and Romer [1990] and McCallum [1986] emphasize, many of the commonly cited reasons for price rigidity are in fact reasons for real rather than nominal price rigidity. Moreover, Ball and Romer show that only a small amount of nominal rigidity can have large effects if real prices are rigid.

16. Some of the items were excluded because cost proxies could not be found. For instance, no reliable producer price indices are available for bamboo and it is known that bamboo shortages have been a key factor in shifting the price of the fly rod. Similarly cost information is difficult to obtain for the binoculars. Since the binoculars have always been produced by a single West German firm, I suspect that approximating costs for this item may be particularly difficult. Finally, for the blankets (British) labor cost data were not readily available. In the case of the blankets, we have already see that competitive factors are very important and that the price point story may not be relevant.

17. Making this type of distinction can be justified for several reasons. First, consumer search activity, which undoubtedly influences these thresholds, is unlikely to be constant. Pursuing the analogy with the McCallum explanation, if rules of thumb are responsible for thresholds then rules of thumb may be abandoned during periods of high inflation. Similarly, changes in the sizes of cost shocks could undermine the importance of price points. If costs grow more rapidly during periods of high inflation, then retailers may choose to jump from price point to price point. Finally, because prices are adjusted more frequently during periods of high inflation, a firm might expect its competitors to be more inclined to follow a price move. Hence, strategic considerations that reinforce being at a particular price point may be less relevant during high inflation periods.

Table I
Frequency of Price Changes

Mnemonic	Item	Dates	Ave. months between price changes & (Std. Dev.)	Number of changes	Longest spell Overall: Dates &	duration (months)	Since 1980: Dates &	duration (months)
LLB_Shoe	Bean Hunting Shoe	53:1-87:2	11.8 (10.9)	36	59:2-63:2	54	85:2-86:2	18
LLB_Mocc	Bean Camp Moccasin	53:1-87:2	11.5 (12.8)	37	59:2-65:1	78	81:1-82:1	18
LLB_Blnk	Bean Hudson Bay Blanket	53:1-87:2	17.8 (15.0)	24	58:1-62:2	60	84:2-87:1	36
ORV-Blnk	Orvis Hudson Bay Blanket	72:1-84:2	14.2 (10.8)	11	81:2-84:2	42	81:2-84:2	42
LLB_Dbag	Bean Zipper Duffle Bag	53:1-87:2	12.9 (9.6)	33	61:2-65:1	48	80:2-81:2	18
LLB_Shrt	Bean Chamois Shirt	53:1-87:2	12.5 (14.2)	34	59:1-65:2	84	85:1-87:1	30
ORV_Shrt	Orvis Chamois Shirt	74:2-87:2	14.7 (14.3)	11	83:2-87:2	54	83:2-87:2	54
REI_Shrt	REI Chamois Shirt	72:1-87:2	14.8 (19.7)	13	81:1-87:1	78	81:1-87:1	78
ORV_Hat	Orvis Fishing Hat	63:1-87:2	18.8 (15.0)	16	63:1-68:2	72	81:1-82:2	24
ORV_Brod	Orvis Bamboo Fly Rod	53:1-85:1	18.0 (14.9)	22	69:2-73:2	54	81:1-82:1	18
ORV_Fly	Orvis Fishing Fly	53:1-87:2	30.4 (31.6)	14	54:1-64:2	132	82:1-84:2	36
ORV_Binc	Orvis 7 inch Binocs.	66:1-86:1	11.2 (9.1)	22	68:1-71:1	42	80:1-81:2	24
All Items		53:1-87:2	14.7 (15.0)	273				

Table II

Average Size of Price Change by Period

Mnemonic	Item	Dates	Complete Sample (# Changes)	High inflation period (1968-1982) (# Changes)	Low inflation period pre-68, post-82 (# Changes)	Wilcoxon Ranks Test: Probability of equal medians
			Average absolute percentage price change			
LLB_Shoe	Bean Hunting Shoe	53:1-87:2	5.5 (35)	4.9 (21)	6.4 (14)	0.18
LLB_Mocc	Bean Camp Moccasin	53:1-87:2	5.7 (36)	5.4 (23)	6.4 (13)	0.72
LLB_Blnk	Bean Hudson Bay Blanket	53:1-87:2	9.0 (23)	11.9 (13)	5.4 (10)	0.34
ORV_Blnk	Orvis Hudson Bay Blanket	72:1-84:2	13.7 (10)	13.7 (10)	n.a.	n.a.
LLB_Dbag	Bean Zipper Duffle Bag	53:1-87:2	7.1 (32)	6.6 (17)	7.6 (15)	0.78
LLB_Shrt	Bean Chamois Shirt	53:1-87:2	4.8 (33)	5.1 (22)	4.4 (11)	0.89
ORV_Shrt	Orvis Chamois Shirt	74:2-87:2	5.3 (13)	5.0 (9)	8.0 (1)	n.a.
REI_Shrt	REI Chamois Shirt	72:1-87:2	10.0 (12)	10.0 (11)	10.0 (1)	n.a.
ORV_Hat	Orvis Fishing Hat	63:1-87:2	17.1 (15)	18.2 (11)	14.0 (4)	0.99
ORV_Brod	Orvis Bamboo Fly Rod	53:1-85:1	11.7 (21)	13.2 (12)	9.8 (9)	0.48
ORV_Fly	Orvis Fishing Fly	53:1-87:2	10.3 (13)	9.9 (9)	11.3 (4)	0.82
ORV_Binc	Orvis 7 inch Binocs.	66:1-86:1	8.4 (21)	7.6 (16)	11.2 (5)	0.15
All	All Items	53:1-87:2	8.1 (261)	8.4 (174)	7.5 (87)	0.75

Catalog Price Data

(See Table 1 for Mnemonics and footnotes 8 and 9 for information used in Table 1 calculations.)

Date		ORV_Brod	ORV_Binc	LLB_Blnk	ORV_Blnk	LLB_Mocc	LLB_Shoe
53	1	86.50	.	28.65	.	5.85	10.85
53	2	86.50	.	28.65	.	5.85	10.85
54	1	86.50	.	28.65	.	5.85	11.85
54	2	86.50	.	28.65	.	5.85	11.85
55	1	86.50	.	28.65	.	5.85	11.85
55	2	86.50	.	28.85	.	5.85	11.85
56	1	90.00	.	29.85	.	6.45	12.85
56	2	90.00	.	29.85	.	6.45	12.85
57	1	90.00	.	29.85	.	6.45	12.85
57	2	90.00	.	29.85	.	6.45	12.85
58	1	90.00	.	30.85	.	6.55	12.85
58	2	90.00	.	30.85	.	6.55	12.85
59	1	98.50	.	30.85	.	6.75	12.85
59	2	98.50	.	30.85	.	7.75	13.35
60	1	98.50	.	30.85	.	7.75	13.35
60	2	98.50	.	30.85	.	7.75	13.35
61	1	98.50	.	30.85	.	7.75	13.35
61	2	98.50	.	30.85	.	7.75	13.35
62	1	98.50	.	30.85	.	7.75	13.35
62	2	98.50	.	30.85	.	7.75	13.35
63	1	106.50	.	32.85	.	7.75	13.35
63	2	106.50	.	32.85	.	7.75	13.35
64	1	106.50	.	32.85	.	7.75	13.85
64	2	106.50	.	33.85	.	7.75	13.85
65	1	106.50	.	33.85	.	7.75	14.85
65	2	106.50	.	33.85	.	7.75	14.85
66	1	120.00	92.50	33.85	.	9.00	14.85
66	2	120.00	92.50	35.00	.	9.25	15.85
67	1	120.00	92.50	36.00	.	9.45	18.35
67	2	120.00	92.50	36.00	.	9.45	18.35
68	1	135.00	97.50	36.00	.	9.75	19.00
68	2	135.00	97.50	36.00	.	9.85	19.00
69	1	135.00	97.50	36.00	.	10.00	19.00
69	2	150.00	97.50	37.00	.	10.50	19.00
70	1	150.00	97.50	37.00	.	10.75	19.85
70	2	150.00	97.50	37.00	.	11.00	20.00
71	1	150.00	97.50	37.00	.	11.50	20.50
71	2	150.00	107.00	37.00	.	11.50	22.00
72	1	150.00	107.00	37.00	39.50	11.90	22.00
72	2	150.00	107.00	37.00	39.50	13.00	22.00
73	1	150.00	110.00	45.00	39.50	13.50	22.00
73	2	150.00	110.00	45.00	55.00	13.50	22.00
74	1	165.00	120.00	45.00	55.00	13.75	23.50
74	2	245.00	154.50	65.00	67.50	14.00	25.00
75	1	245.00	159.75	65.00	67.50	14.50	26.50
75	2	245.00	162.75	65.00	69.75	15.00	27.00

Date		ORV_Brod	ORV_Binc	LLB_Blnk	ORV_Blnk	LLB_Mocc	LLB_Shoe
76	1	245.00	177.75	65.00	69.75	16.50	27.50
76	2	257.00	172.75	65.00	69.75	16.50	29.00
77	1	257.00	177.75	65.00	69.75	17.50	29.00
77	2	270.00	187.50	72.00	77.00	18.00	30.00
78	1	270.00	191.00	86.00	91.00	18.00	31.00
78	2	288.00	193.00	86.00	92.00	19.50	33.00
79	1	288.00	230.00	88.50	92.00	21.00	36.00
79	2	330.00	230.00	97.00	98.50	25.00	41.00
80	1	380.00	269.50	110.00	110.00	27.75	41.00
80	2	420.00	269.50	111.00	110.00	27.75	42.75
81	1	460.00	269.50	112.00	131.00	29.75	41.75
81	2	505.00	269.50	131.00	136.00	29.75	42.50
82	1	505.00	269.00	132.00	136.00	29.75	45.25
82	2	505.00	269.00	145.00	136.00	31.00	47.75
83	1	550.00	269.00	145.00	136.00	32.75	49.75
83	2	550.00	250.00	145.00	136.00	32.75	49.75
84	1	605.00	260.00	145.00	136.00	33.75	51.25
84	2	695.00	225.00	120.00	136.00	35.75	48.75
85	1	800.00	225.00	120.00	.	35.75	52.75
85	2	.	195.00	120.00	.	37.75	53.00
86	1	.	230.00	120.00	.	37.75	53.00
86	2	.	.	120.00	.	37.75	53.00
87	1	.	.	120.00	.	38.50	55.00
87	2	.	.	109.00	.	38.50	55.00

Date		ORV_Cap	ORV_Shrt	REI_Shrt	LLB_Shrt	LLB_Dbag	ORV_Fly
53	1	.	.	.	5.45	7.85	0.42
53	2	.	.	.	5.45	7.85	0.42
54	1	.	.	.	5.45	7.85	0.50
54	2	.	.	.	5.15	7.75	0.50
55	1	.	.	.	5.15	8.65	0.50
55	2	.	.	.	5.15	8.65	0.50
56	1	.	.	.	5.35	8.85	0.50
56	2	.	.	.	5.35	8.85	0.50
57	1	.	.	.	5.65	10.90	0.50
57	2	.	.	.	5.65	10.90	0.50
58	1	.	.	.	5.65	10.90	0.50
58	2	.	.	.	5.65	10.90	0.50
59	1	.	.	.	5.85	10.90	0.50
59	2	.	.	.	5.85	11.90	0.50
60	1	.	.	.	5.85	11.90	0.50
60	2	.	.	.	5.85	11.90	0.50
61	1	.	.	.	5.85	11.90	0.50
61	2	.	.	.	5.85	12.85	0.50
62	1	.	.	.	5.85	12.85	0.50
62	2	.	.	.	5.85	12.85	0.50
63	1	2.50	.	.	5.85	12.85	0.50

Date		ORV_Cap	ORV_Shrt	REI_Shrt	LLB_Shrt	LLB_Dbag	ORV_Fly
63	2	2.50	.	.	5.85	12.85	0.50
64	1	2.50	.	.	5.85	12.85	0.50
64	2	2.50	.	.	5.85	12.85	0.50
65	1	2.50	.	.	5.85	12.85	0.55
65	2	2.50	.	.	5.85	11.65	0.55
66	1	2.50	.	.	6.25	11.65	0.55
66	2	2.50	.	.	6.25	11.65	0.55
67	1	2.50	.	.	6.45	14.50	0.60
67	2	2.50	.	.	6.45	14.50	0.60
68	1	2.50	.	.	6.85	14.00	0.65
68	2	2.50	.	.	6.85	14.00	0.65
69	1	2.95	.	.	7.00	14.00	0.65
69	2	2.95	.	.	7.50	14.00	0.65
70	1	2.95	.	.	7.85	14.00	0.75
70	2	2.95	.	.	8.00	14.50	0.75
71	1	5.50	.	.	8.35	14.50	0.75
71	2	5.50	.	.	8.50	14.50	0.75
72	1	6.50	.	8.50	8.35	14.50	0.75
72	2	6.50	.	8.50	8.35	15.00	0.75
73	1	7.50	.	11.00	8.35	15.00	0.75
73	2	7.50	.	11.00	8.85	15.50	0.75
74	1	7.50	.	14.25	10.00	16.50	0.80
74	2	7.75	17.00	14.25	12.00	16.50	0.80
75	1	7.75	17.95	14.25	12.50	17.00	0.90
75	2	7.75	17.50	14.25	12.50	17.00	0.90
76	1	7.95	17.50	14.75	12.50	18.50	0.90
76	2	7.95	17.95	14.75	12.50	20.50	0.90
77	1	8.75	17.95	15.95	13.00	22.00	0.90
77	2	8.75	18.50	16.95	13.00	23.00	0.90
78	1	9.95	19.50	17.95	13.50	23.00	1.00
78	2	9.95	19.50	17.95	13.50	23.50	1.00
79	1	10.45	19.50	19.00	14.00	24.00	1.10
79	2	10.45	19.95	19.50	14.25	27.00	1.10
80	1	12.50	20.95	17.95	14.75	32.00	1.20
80	2	12.50	20.95	19.50	15.75	29.75	1.20
81	1	13.50	22.50	19.95	16.50	29.75	1.30
81	2	13.50	24.95	19.95	17.00	29.75	1.30
82	1	13.50	24.95	19.95	17.50	31.50	1.40
82	2	13.50	24.95	19.95	18.25	34.25	1.40
83	1	15.00	24.95	19.95	19.00	35.25	1.40
83	2	15.00	22.95	19.95	19.75	35.25	1.40
84	1	16.75	22.95	19.95	19.75	36.00	1.40
84	2	16.75	22.95	19.95	19.75	38.00	1.40
85	1	17.50	22.95	19.95	21.00	36.00	1.50
85	2	17.50	22.95	19.95	21.00	36.00	1.50
86	1	17.50	22.95	19.95	21.00	38.00	1.50
86	2	17.50	22.95	19.95	21.00	38.00	1.50
87	1	12.50	22.95	19.95	21.00	39.00	1.50
87	2	12.50	22.95	21.95	21.50	39.50	1.50

Figure IA

Sizes of Price Changes

Average Absolute Percent Changes

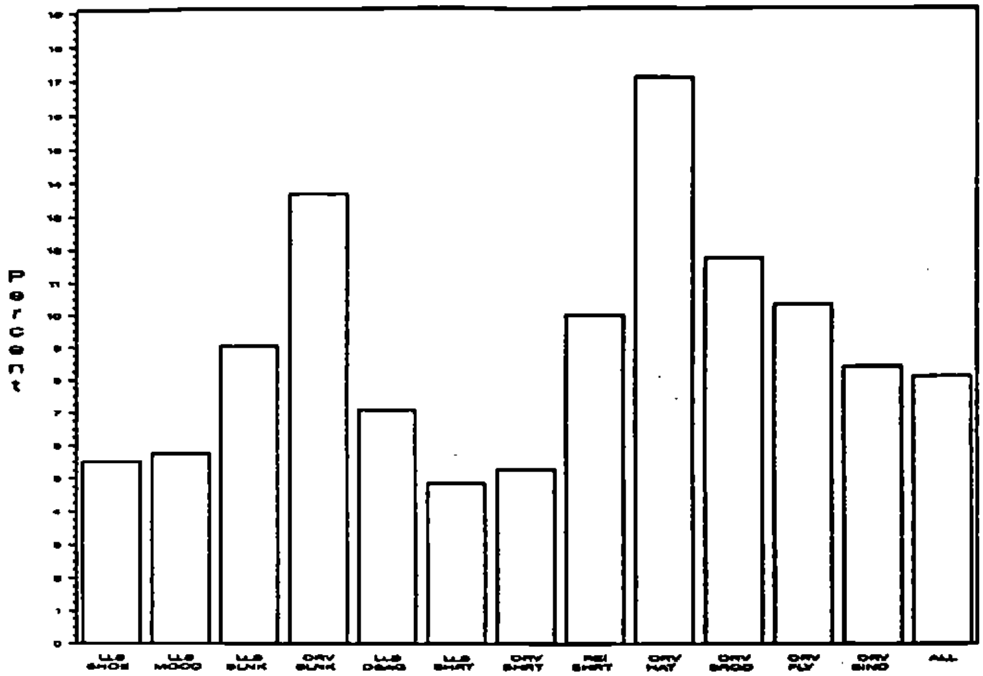


Figure IB

Distribution of Price Changes

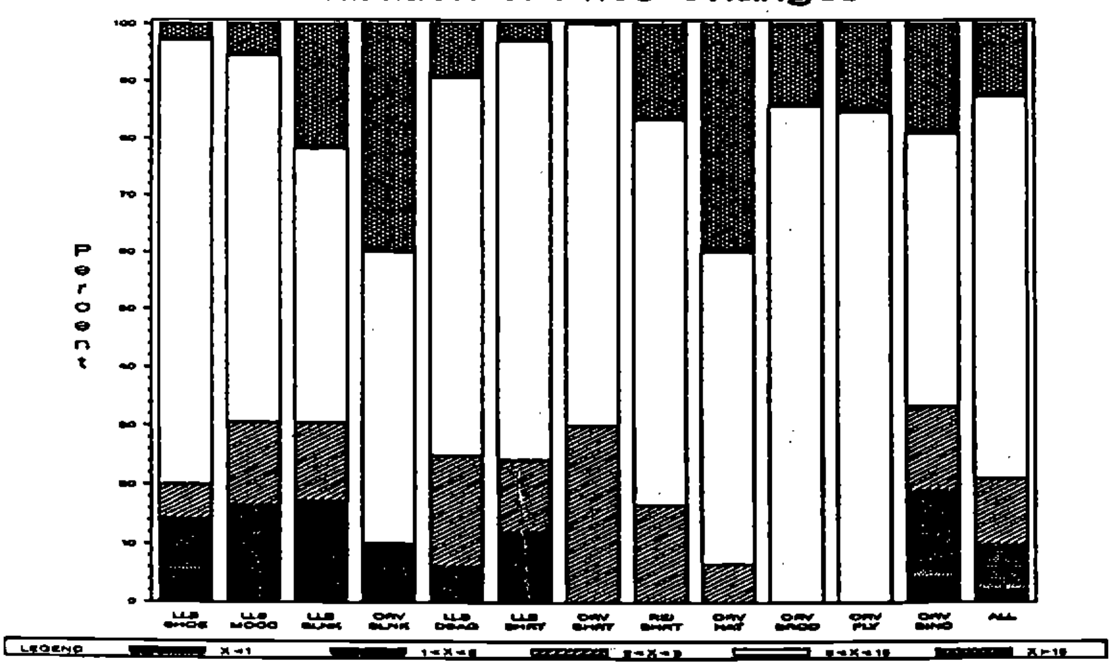
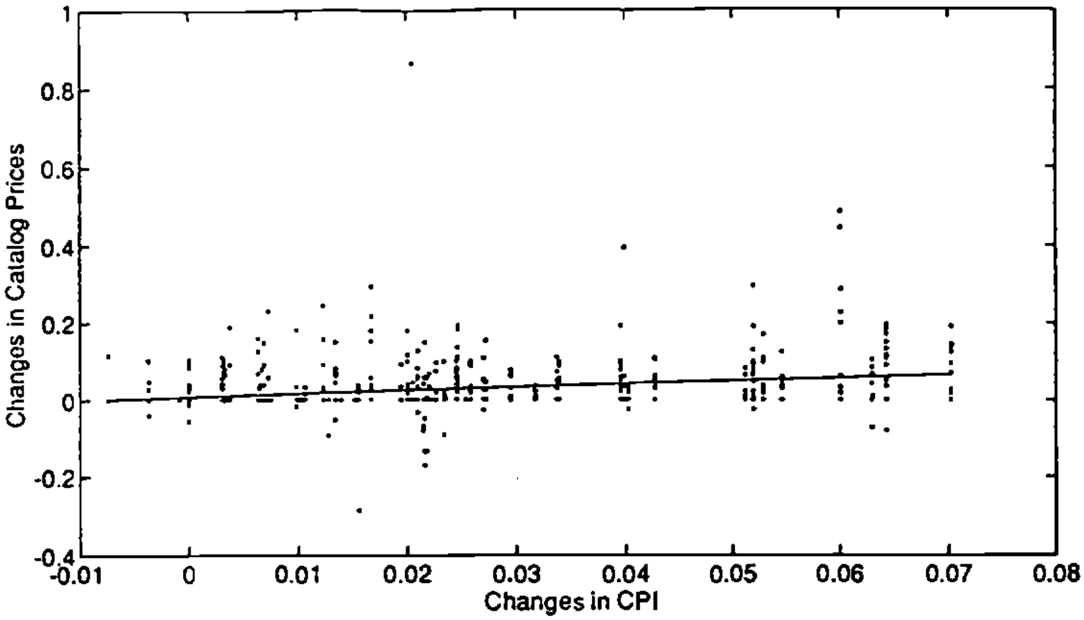
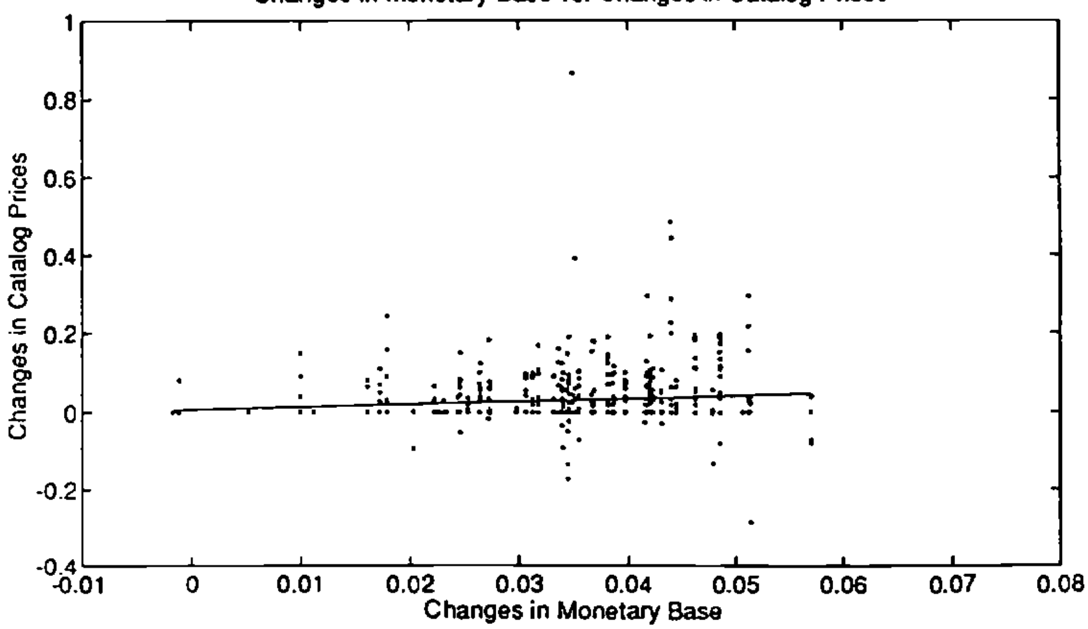


Figure IIA
Changes in CPI (Urban, All Items) vs. Changes in Catalog Prices



Note: Solid line shows best fitting regression line

Figure IIB
Changes in Monetary Base vs. Changes in Catalog Prices

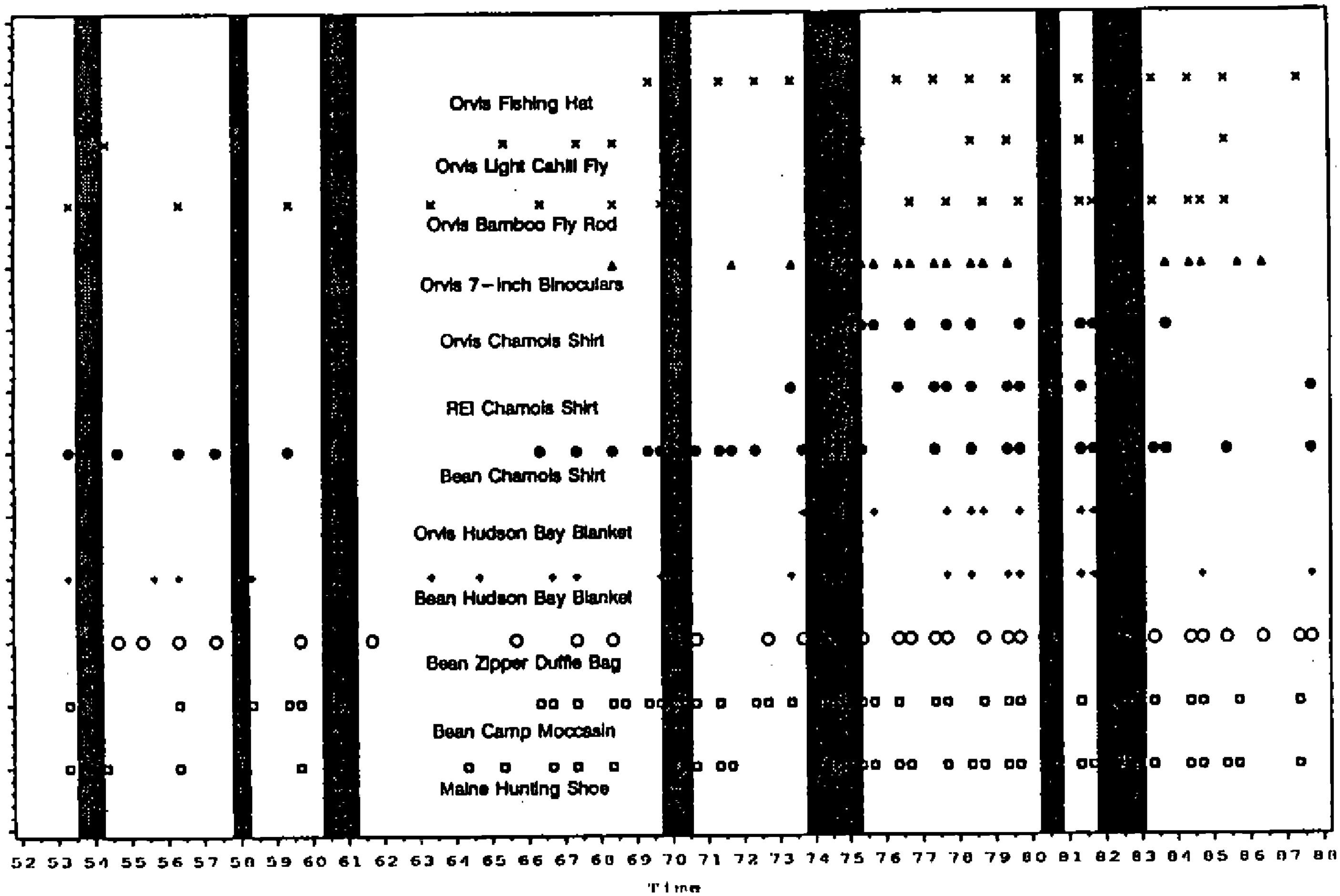


Note: Solid line shows best fitting regression line

Figure III

Timing of Price Changes

First Symbol Per Item Shows First Observation



Note: Shaded regions show periods designated as recessions by the National Bureau of Economic Research