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UNDERSTANDING THE CONSUMER PRICE INDEX

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Introduction

With the discussion of indexing the income tax growing more widespread as time passes, interest in the consumer price index is in the same manner increasing. Although the index has been used in a number of ways since its inception, its straightforward meaning for people has been simple: prices rise, so, what can be done? People in general have felt impotent to deal with price increases. With Minnesota's recent change in its approach to taxing income, i.e., by indexing parts of the income tax structure, this economic statistic takes on new meaning.

The need to shed some light on the consumer price index, and perhaps to provide some answers to inquiries about it, serves as the impetus to this report. The approach will be to answer general questions such as, what exactly is the index? How is it derived? What are its weaknesses? and, What have been its historical uses? In addition, items specific to the Minneapolis-St. Paul CPI and the relationship between this index and the national one will be examined.

Since the Bureau of Labor Statistics is responsible for the consumer price index, this report draws heavily on its publications. As such, this report serves to disseminate knowledge rather than to present new ideas.

Defining the Index

To understand what the consumer price index is, one should know what it is not. Most important, the index is not a measure of changes in the cost of living. There are important differences between a cost-of-living index and the consumer price index.

The CPI compares the cost of a specific market basket of goods and services with its cost a month ago, a year ago, or ten years ago. But in reality, people do not continue to purchase the same market basket of goods and services month after month and year after year. Rather, as prices change relative to one another, people will substitute a less expensive good or service for a more expensive one. A good example of this is with food. As the price of beef increases, consumers buy less beef and more fish and poultry. A true cost-of-living measure would take such behavior into account. Other important examples of things that the CPI does not take into account that a cost-of-living index would, are income and social security taxes. As these increase, so does the cost-of-living. But because they are not directly associated with the purchase prices of goods and services, they are not included in the CPI.

Given this understanding, what then is the consumer price index? The Bureau of Labor Statistics defines it as the "price change of a constant market basket of goods and services over time." This definition inheres a number of concepts that are not at first blush fully clear. What is a market basket of goods and services? How is it developed? How is the price change measured? Which goods and which services? These are all important issues to be addressed.

Before proceeding a note here is necessary. Historically, the consumer price index has represented only urban wage earners and clerical workers. In 1978, following twelve years of research and debate, a new index was introduced

covering all urban consumers. Although there are clear differences between the two, most of the discussion below applies equally to both. The main difference is in the population groups covered. The CPI for urban wage earners and clerical workers includes just such workers, given they meet certain income requirements. The All Urban Consumer Price Index includes salaried workers, self-employed persons, retirees and unemployed persons as well as urban wage earners and clerical workers.

The Market Basket of Goods and Services

The development of the market basket of goods and services has occurred over a long period of time. What it is, essentially, is a group of those items representing what is felt to be the average purchases of an American family. Covered generally are all goods and services purchased for consumption, including both necessities and luxuries. The basket for the current index is based on a Consumer Expenditure Survey taken in 1972 and 1973. From this survey, major expenditure groups were defined and weighted in such a way as be to proportional to the importance of that expenditure to the family. Examples of these weights and how they have changed over time are given in Table 1. This table also evidences a second difference between the All Urban Consumers Price Index and the Wage Earners and Clerical Workers Consumer Price Index, and that is different weights are attached to the various groups.

Table 1. Percent Distribution of the Consumer Price Index Market Basket by Major Expenditure Group, Benchmark Years

Major Group	Wage Earners and Clerical Workers				All Urban Consumers
	1935-39[a]	1952[b]	1963[c]	1972-73[d]	1972-73[d]
Food and Alcoholic Beverages	35.4	32.2	25.2	20.4	18.8
Housing	33.7	33.5	34.9	39.8	42.9
Apparel	11.0	9.4	10.6	7.0	7.0
Transportation	8.1	11.3	14.0	19.8	17.7
Medical Care	4.1	4.8	5.7	4.2	4.6
Entertainment	2.8	4.0	3.9	4.3	4.5
Personal Care	2.5	2.1	2.8	1.8	1.7
Other Goods and Services	2.4	2.7	2.9	2.7	2.8

[a] Relative importance for the survey period 1934-36 (updated for price change).

[b] Relative importance for the survey period 1947-49 (updated for price change).

[c] Relative importance for the survey period 1960-61 (updated for price change).

[d] Relative importance for the survey period 1972-73. Revised indexes which require expenditure weights updated for price change between the survey period and the link dates will differ from those shown. See Table 2 for relative importance as of December, 1978.

The survey itself was undertaken through the joint effort of the Bureau of Labor Statistics and the Bureau of the Census. It involved 20,000 families in 216 areas across the country. In Minnesota, four areas were covered. From the Twin Cities, 269 families were surveyed. The Duluth-Superior area had 52, Freeborn and Faribault counties combined had 64, and Koochiching county had 55 sample families.

Although this survey was the basis for the current index, the weights are not fixed. A smaller, less expensive survey will be undertaken on a continuing basis. The response of about 6,000 households is expected with expenditure data expected to be released 6 to 9 months after the data has been gathered. When the weights will be changed because of this new data has yet to be determined. One possibility is that the data may be accumulated over a period of

time, perhaps five years, and at the end of that period new weights will be determined. The economic conditions of the nation will have much effect on the determination. If the times are highly inflationary, a shorter lag in weight changes can surely be expected. Table 2 gives a further breakdown of the relative importance of each major group and items within each group.

Consumer Price Index for Urban Wage Earners and Clerical Workers: By Expenditure Category and Commodity and Service Group, 1967=100

Table 2

Group	Relative importance, December 1978	Unadjusted indexes Mar. 1979	Apr. 1979	Unadjusted percent change to Apr. 1979 from- Apr. 1978	Mar. 1979	Seasonally adjusted percent change from- Jan. to Feb.	Feb. to Mar.	Mar. to Apr.
Expenditure category								
All items	100.000	209.3	211.8	10.7	1.2	1.2	1.1	1.1
All items(1957-59=100)	-	243.5	246.3	-	-	-	-	-
Food and beverages	20.946	225.1	226.7	12.1	.7	1.7	1.2	.8
Food	19.777	231.1	232.7	12.4	.7	1.8	1.2	.9
Food at home	13.899	230.0	231.4	12.3	.6	1.9	1.1	.9
Cereals and bakery products	1.715	214.1	215.2	10.0	.5	.9	.4	.6
Meats, poultry, fish, and eggs	4.862	236.9	239.4	20.6	1.1	3.8	2.4	2.1
Dairy products	1.856	202.3	203.0	11.8	.3	1.2	1.1	.5
Fruits and vegetables	1.818	225.4	224.6	7.0	-.4	.8	-.6	-1.6
Sugar and sweets	.472	272.4	273.6	7.5	.4	.0	.7	.9
Fats and oils	.398	219.8	223.0	8.7	1.5	1.3	.4	1.4
Nonalcoholic beverages 1/	1.615	346.9	347.8	2.1	.3	.8	.0	.3
Other prepared foods	1.164	203.0	204.5	9.9	.7	.8	.5	.7
Food away from home	5.877	237.9	240.4	12.6	1.1	1.5	1.5	1.0
Alcoholic beverages	1.169	169.6	170.6	7.6	.6	.8	1.0	.5
Housing	40.957	217.5	219.7	10.9	1.0	1.3	1.0	1.1
Shelter	26.969	228.5	231.2	13.1	1.2	1.7	1.1	1.3
Rent, residential	5.238	171.2	171.9	6.5	.4	.4	.2	.5
Other rental costs	.504	226.3	228.0	12.4	.8	1.6	.3	1.1
Homeownership	21.227	249.2	252.7	14.8	1.4	1.9	1.4	1.5
Home purchase	6.921	212.7	215.4	12.4	1.3	1.4	.9	1.3
Financing, taxes, and insurance	8.987	289.5	294.0	18.5	1.6	3.0	2.0	1.9
Maintenance and repairs	3.320	248.4	251.7	11.1	1.3	.7	1.1	1.0
Maintenance and repair services	2.351	269.3	273.8	12.2	1.7	.6	1.3	1.6
Maintenance and repair commodities	.969	201.5	202.6	8.3	.5	1.0	.4	-.1
Fuel and other utilities	6.221	226.0	227.8	6.4	.8	.8	1.0	1.0
Fuels	4.215	263.7	266.7	9.1	1.1	1.2	1.5	1.4
Fuel oil, coal, and bottled gas	.875	340.0	350.3	18.1	3.0	2.6	4.8	3.8
Gas (piped) and electricity	3.340	243.6	245.1	6.8	.6	.8	.7	.7
Other utilities and public services	2.006	158.9	158.9	.7	.0	.0	-.1	.1
Household furnishings and operation	7.767	186.3	187.3	7.3	.5	.4	.7	.4
Housefurnishings	4.571	160.8	161.9	6.1	.7	.4	.7	.5
Housekeeping supplies	1.601	218.1	218.1	7.3	.0	.6	.8	-.1
Housekeeping services	1.596	241.6	243.1	10.6	.6	.3	.5	.7
Apparel and upkeep	5.524	164.2	165.4	4.6	.7	.2	1.3	.4
Apparel commodities	4.886	159.3	160.4	3.9	.7	.1	1.4	.3
Men's and boys' apparel	1.531	159.4	160.1	2.2	.4	-.8	.6	.1
Women's and girls' apparel	1.927	151.2	152.1	2.6	.6	.5	2.3	.2
Infants' and toddlers' apparel	.131	217.7	222.0	3.2	2.0	.2	.9	1.2
Footwear	.735	170.4	174.2	8.1	2.2	-.3	1.2	1.8
Other apparel commodities	.562	168.9	167.8	7.2	-.7	1.8	.8	-.8
Apparel services 1/	.637	199.0	201.1	10.6	1.1	1.4	1.1	1.1
Transportation	20.045	198.7	203.7	12.4	2.5	1.1	1.2	2.0
Private transportation	19.121	198.5	203.7	12.9	2.6	1.1	1.2	2.0
New cars	4.154	162.4	163.9	8.4	.9	1.3	.7	1.3
Used cars	4.019	195.4	200.0	12.8	2.4	.8	-.3	-.5
Gasoline	4.769	221.2	235.4	23.6	6.4	2.1	3.8	6.0
Maintenance and repair	1.665	236.8	238.7	10.0	.8	.9	.9	1.0
Other private transportation	4.514	193.9	195.5	6.8	.8	.4	.5	.7
Other private trans. commodities	.804	170.0	171.4	8.3	.8	1.4	-.4	1.2
Other private trans. services	3.710	202.2	203.8	6.5	.8	.2	.8	.6
Public transportation	.924	192.1	193.6	3.4	.8	.7	.2	1.2
Medical care	4.489	233.7	235.2	9.1	.6	.7	.6	.7
Medical care commodities	.771	151.7	152.5	7.2	.5	.5	.7	.3
Medical care services	3.717	251.3	252.9	9.5	.6	.7	.7	.7
Professional services 1/	1.900	222.7	224.2	8.9	.7	.7	.8	.7
Other medical care services	1.817	286.1	287.8	10.1	.6	.6	.6	.8
Entertainment	3.794	184.0	185.5	5.8	.8	.2	.9	.5
Entertainment commodities	2.396	184.4	185.7	5.5	.7	.3	1.0	.4
Entertainment services	1.398	184.3	186.1	6.4	1.0	-.1	.7	.9
Other goods and services	4.245	192.6	193.1	7.2	.3	.8	.5	.5
Tobacco products	1.392	185.8	186.1	7.0	.2	1.2	.4	.5
Personal care 1/	1.762	191.5	192.3	7.0	.4	.8	.6	.4
Toilet goods and personal care appliances 1/	.838	185.9	186.2	6.6	.2	1.3	.6	.2
Personal care services 1/	.924	197.3	198.5	7.4	.6	.6	.5	.6
Personal and educational expenses	1.091	208.6	208.8	7.8	.1	.3	.5	.5
School books and supplies	.163	194.1	194.2	7.2	.1	.8	.7	.6
Personal and educational services	.929	212.5	212.8	7.9	.1	.2	.4	.5
Commodity and service group								
All items	100.000	209.3	211.8	10.7	1.2	1.2	1.1	1.1
Commodities	62.074	200.9	203.6	11.0	1.3	1.3	1.2	1.2
Food and beverages	20.946	225.1	226.7	12.1	.7	1.7	1.2	.8
Commodities less food and beverages	41.128	187.0	190.2	10.5	1.7	1.0	1.2	1.3
Nondurables less food and beverages	17.651	188.4	192.7	11.0	2.3	.9	2.0	2.1
Apparel commodities	4.886	159.3	160.4	3.9	.7	.1	1.4	.3
Nondurables less food, beverages, and apparel 1/	12.765	206.5	212.3	13.7	2.8	1.4	2.1	2.8
Durables	23.477	184.5	186.8	10.1	1.2	.9	.5	.9
Services	37.926	225.1	227.1	10.0	.9	1.1	.9	1.0
Rent, residential	5.238	171.2	171.9	6.5	.4	.4	.2	.5
Household services less rent	18.784	254.3	257.2	12.7	1.1	1.7	1.3	1.3
Transportation services	6.299	207.4	209.0	6.9	.8	.4	.7	.8
Medical care services	3.717	251.3	252.9	9.5	.6	.7	.7	.7
Other services	3.888	195.0	196.4	7.7	.7	.4	.7	.8
Special indexes:								
All items less food	80.223	203.7	206.3	10.2	1.3	1.0	1.0	1.2
All items less shelter	73.031	204.0	206.4	9.8	1.2	1.0	1.0	1.1
All items less mortgage interest costs 1/	93.132	204.5	206.8	9.6	1.1	1.0	1.0	1.1
All items less medical care	95.511	207.8	210.4	10.7	1.3	1.2	1.1	1.2
Commodities less food	42.297	185.9	189.0	10.4	1.7	1.0	1.1	1.3
Nondurables less food	18.820	186.3	190.2	10.7	2.1	.9	2.0	1.9
Nondurables less food and apparel 1/	13.934	200.5	205.8	13.3	2.6	1.3	2.0	2.6
Nondurables 1/	38.597	207.6	210.6	11.6	1.4	1.5	1.5	1.4
Services less rent	52.689	235.0	237.3	10.6	1.0	1.2	1.0	1.1
Services less medical care 1/	34.209	220.8	222.9	10.1	1.0	1.0	.8	1.0
Energy 1/	9.085	241.7	251.2	16.6	3.9	1.5	2.7	3.9
All items less energy 1/	90.915	207.1	209.0	10.1	.9	1.2	.9	.9
All items less food and energy 1/	71.138	200.2	202.1	9.4	.9	.9	.9	.9
Commodities less food and energy	36.552	180.0	181.8	8.5	1.0	.7	.6	.8
Energy commodities 1/	5.745	240.0	253.9	22.7	5.8	2.0	3.7	5.8
Services less energy	34.586	223.7	225.8	10.4	.9	1.1	.9	1.0
Purchasing power of the consumer dollar:								
1967=$1.00 1/	-	$.478	$.472	-9.6	-1.3	-1.2	-1.0	-1.3
1957-59=$1.00 1/	-	.411	.406	-	-	-	-	-

1/ Not seasonally adjusted.
NOTE: Index applies to a month as a whole, not to any specific date.

Source: NEWS-U.S. Dept. of Labor
April, 1979

Deriving the Index

Once the market basket is determined, there is the question of how the price index itself was derived. First, price and quantity quotations on the item in the market basket are gathered. These are then compared to a base year through the use of an index formula. In the case of the CPI, a modified Laspeyers formula is used. (The explanation of this may be found in most standard introductory statistics books). The base year is simply a standard against which to measure the new index number. To facilitate matters, the standard is set equal to 100. For the current index, the base year is 1967. This means is that if the index is equal to 150, the cost of the market basket is 50% greater than its cost in 1967.

The quotations themselves number about 700,000 food prices per year, 28,000 property tax figures per year, 70,000 rent changes per year and about 675,000 items other than food, rent and property taxes. These quotations are garnered from about 60,600 reporters (food store outlets, rental units, housing units, etc.) over the course of the year. For the Minneapolis-St. Paul CPI, there are 490 reporters and 2,492 price quotations taken every price cycle. The pricing cycle is the length of time between the announcement of the official indices; for the Twin Cities this is every two months.

Prices are gathered both directly and indirectly. For some items, such as food, local persons are trained to gather the information. For other items, a Bureau of Labor Statistics employee contacts the reporting outlet for price information. Some data on price changes are obtained indirectly, i.e., through other federal agencies. For example, data on cost changes for rental housing is provided by the Department of Housing and Urban Development.

History of CPI

The first consumer price index was developed in 1917 for specific use as an escalator. During World War I the Shipbuilding Labor Adjustment Board investigated the cost of living in shipbuilding and other industrial centers in order to arrive at a "fair wage scale". Following this action, the Bureau of Labor Statistics began publishing a national index in 1921. This is the forerunner of today's consumer price index. There were major revisions in the index in 1940, 1953, 1964 and, most recently, in 1978.

Consumer Price Index figures for the Twin Cities were originally published annually in 1917. From 1919 to 1941 the figures were published semi-annually; between 1941 and 1947 they came out monthly. From 1948 to the most recent revision (1978) the index was published quarterly. With the 1978 revision, both indices will be published bi-monthly.

Whether both indices (the All Consumer and Urban Wage Earner...) will continue to be published indefinitely is still a question for discussion. Since most escalator clauses are based on the Urban Wage Earner and Clerical Workers Index, labor has arqued vehemently for its retention. However, the All Urban Consumers Index is considered a much better measure for the population as a whole.

National-Local Comparisons

Often, the question is asked, is inflation worse in the Twin Cities than it is in the nation on a whole? Because of the construction of the index, this question can not be clearly answered. But some comparisons can be made and perhaps some insight can be gained into the relationship between the two. For

the purposes of this comparison, the revised consumer price index for wage earners and clerical workers for both Minneapolis-St. Paul and the U.S. will be used. Because of the newness of the all urban consumer index, little is known about how it relates to the revised index for wage earners and clerical workers, but up to this point, the two have moved quite closely together. But since much historical data for the revised wage earners' index is available, it will be used for comparative purposes. Between the years 1953 and 1978, the correlation between Minneapolis-St. Paul (M-SP) and U.S. figures was extremely high. (In fact, the correlation statistic approaches one). Since that time, this has not been the case, as is evidenced by Figure 1. This is especially true starting in 1977: I where the M-SP CPI exceeds the U.S. CPI for each period. This does not mean that the rate of inflation in every period is greater in Minneapolis-St. Paul than in the nation on a whole. The rate of inflation is not given by the absolute size of the index, but rather by the percentage change in the index from period to period.

An example of this is useful:

	U.S.	M.-S.P.
Period 1	190.1	195.2
Period 2	193.1	196.3
Index Point Change	2.0	1.1
Percent Change	$\frac{2.0}{190.1} \times 100 = 1.05$	$\frac{1.1}{195.2} \times 100 = .563$

Here, even though the M-SP index is higher, the rate of inflation between Period 1 and Period 2 is about one-half the US rate.

This is shown in Figure 2. Here, when the slopes of the two lines are equal, the rate of change, i.e., the inflation rates, are equal. What then, do differing levels of the indices imply? Differing levels mean that at

some period the rate of inflation pushed one index higher than the other relative to the particular market basket of goods in each area. Even though the baskets themselves are the same, the initial prices, i.e., the 1967 prices, probably differed between the areas. Comparing levels then, is useful only if the initial prices of the items were the same.

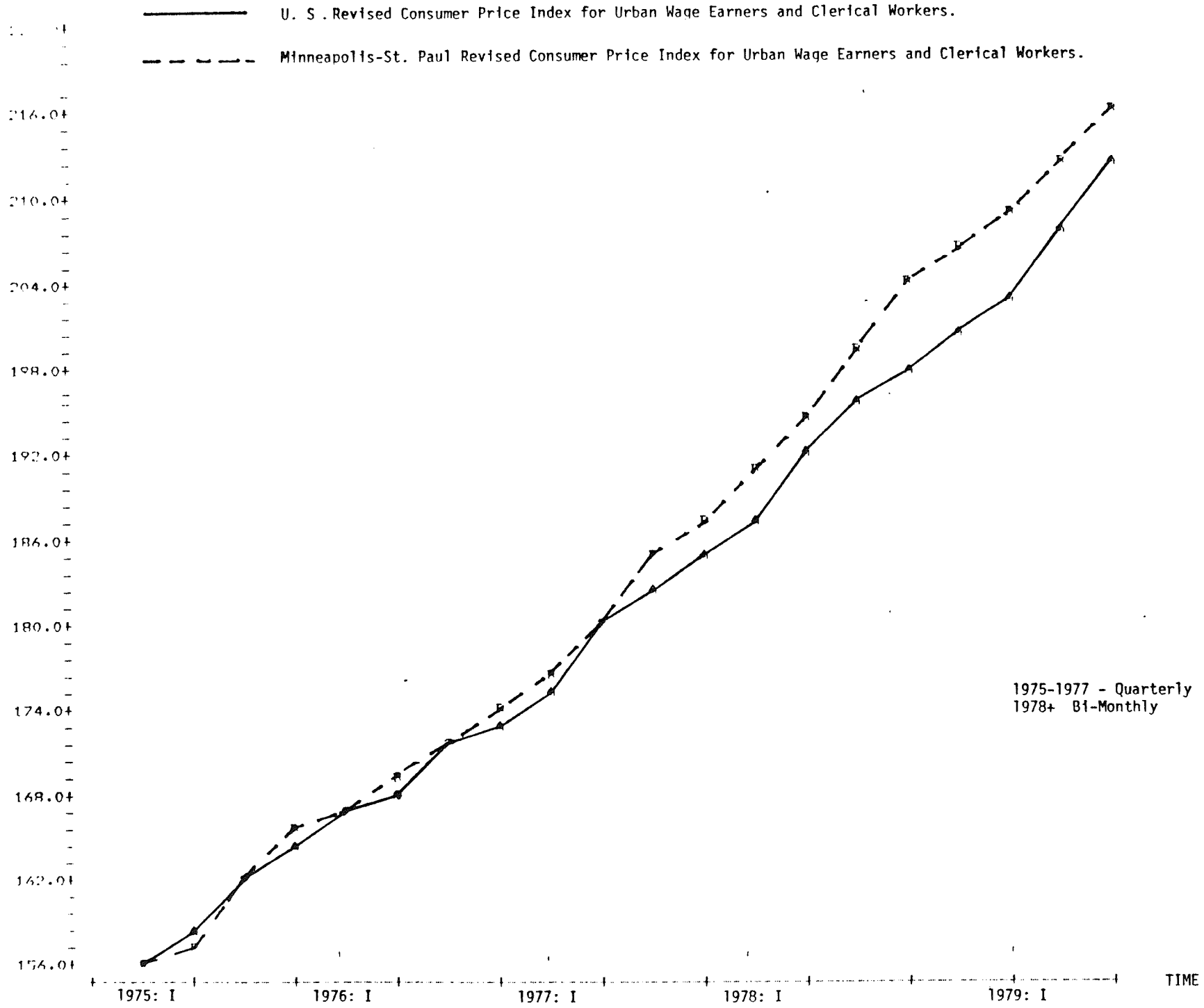
U. S . Revised Consumer Price Index for Urban Wage Earners and Clerical Workers.
Minneapolis-St. Paul Revised Consumer Price Index for Urban Wage Earners and Clerical Workers.
216.0+
210.0+
204.0+
198.0+
192.0+
186.0+
180.0+
174.0+
168.0+
162.0+
156.0+
1975: I
1976: I
1977: I
1978: I
1979: I
TIME
1975-1977 - Quarterly
1978+ Bi-Monthly

Figure 1

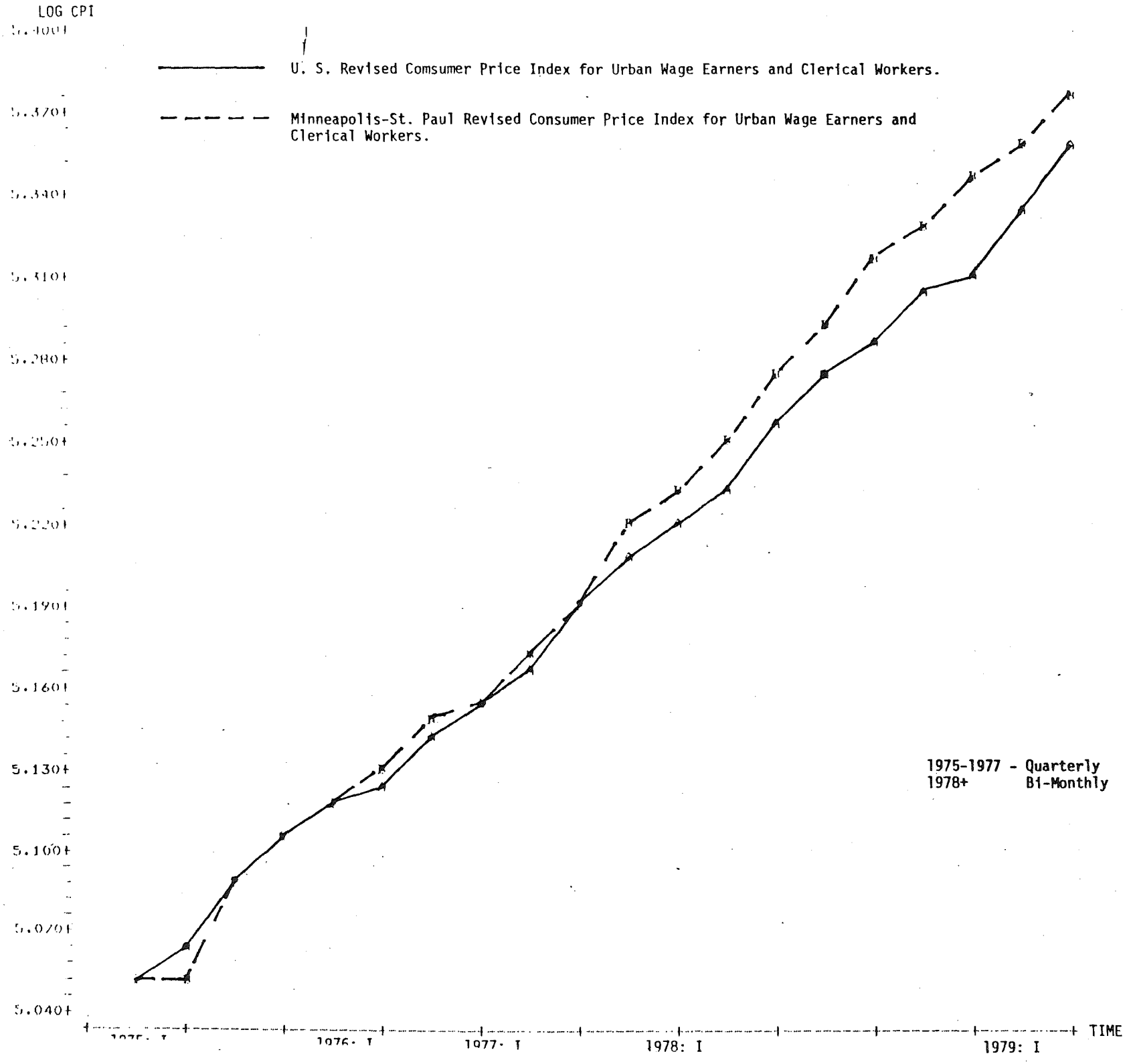
LOG CPI
U. S. Revised Comsumer Price Index for Urban Wage Earners and Clerical Workers.
Minneapolis-St. Paul Revised Consumer Price Index for Urban Wage Earners and Clerical Workers.
5.370+
5.340+
5.310+
5.280+
5.250+
5.220+
5.190+
5.160+
5.130+
5.100+
5.070+
5.040+
1976: I
1977: I
1978: I
1979: I
TIME
1975-1977 - Quarterly
1978+ Bi-Monthly

Figure 2

Uses of the CPI

There have been a number of ways that the consumer price index has been employed. Clearly one important use has been the direct measure of price changes. With inflation considered to be a major national economic problem the statistic is of great importance to congressional and administration officials. Its observed changes indicate the efficacy of the anti-inflationary policies set by these officials. The CPI is just one of many price indices followed by the government. There is also the Producers Price Index (formerly the Wholesale Price Index) and an index measuring price changes in the industrial spot markets. These indices are all used as general indicators of economic health.

The consumer price index is used to deflate economic time series. Economists have for years used the CPI in this way in their research efforts. A good example of this is the difference between real and nominal income. Real income at any one time is simply nominal income divided by the appropriate price index. Other general economic indicators are adjusted so that, freed from the influence of inflation, their true condition may be judged. An example of such deflation is useful:

	Index	Nominal Income		Real Income	
1967	100	25,260	5,340	25,260	2,670
1979	200	30,600		27,930	

In order to find the change in real income, the difference in nominal income is calculated. The 1979 index is then divided by 100 (recall it was multiplied by 100 to make it an "index number"). In this example, the result is 2. The change in nominal income is then divided by 2 to arrive at the change in real income. Thus, although nominal income increased by $5,340, because the price index doubled, the increase in real income is only half this amount, or $2,670.

A third use is to escalate income payments. As of January 1977, approximately 61%, over 6 million persons, of all workers in major bargaining units had escalator clauses in their contracts. No doubt today this number is even higher. Federal salaries, social security benefits, and food stamp programs are among the other income payments adjusted by the CPI.

To digress a moment, the CPI is usually published in two forms, unadjusted and seasonally adjusted. While the adjusted index is the one generally quoted in the media, it is the unadjusted index that is usually used in escalator clauses.

Accuracy in the CPI takes on special importance when the measure is used as an escalator. It has been estimated that a .1% error has the potential of misdiverting $100 million in income payments.

Conceptual Problems

Given the number of revisions and improvements in the consumer price index, does it still have any major weaknesses? The answer is yes, and there are some uncertainties in employing the CPI because of them.

The data gathered from the 1972-73 consumer expenditure survey is the basis for the market basket used in the current CPI. But clearly buying patterns have changed, new products have been introduced, and old products have been discontinued. This is a problem the BLS is working on. A smaller version of the expenditure survey is being put together and will be undertaken on a continuing basis. With this, necessary revisions in the market basket will be made much sooner than they have in the past, but there will still be an unavoidable lag. Such revisions will undoubtably be slight but not unimportant to the quality of the index.

A second problem is with the question of quality changes in the items in the market basket. Since the index is built to measure price changes in the same article, those price changes due to quality changes must be recognized and adjusted for. However, directly measuring quality changes is extremely difficult. The method the BLS uses is to measure the price change resulting from quality adjustments by evaluating the additional cost associated with producing that adjustment. But only substantive changes in goods and services are accounted for; changes in style, etc. are not. Often new technology leads to a lower cost for an item of higher quality. If no satisfactory adjustment for an item can be developed, quality changes are ignored and prices are compared directly.

Given those weaknesses, it has been claimed by some that the published CPI overestimates real price changes. While there may be some validity to this claim, no empirical evidence has yet been produced to support it.

Conclusion

Even with its weaknesses and shortcomings, the consumer price index remains the best measure we have for recognizing the degree of inflation extant. Perhaps more important, it helps us to understand how inflation is caused and where some of its solutions may come from. With the most recent improvements in the index, the evolutionary process has not come to a standstill. With more efficient data gathering techniques and changing statistical methodology, there will always be room for improvement in the index.