ANALYSIS OF INFLATION FACTOR USED IN SETTING OUTLIER THRESHOLDS
FY 2003

ADDENDUM
ASSESSMENT OF THE THREE-YEAR LAG METHOD

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June 27, 2002

INTRODUCTION

The purpose of this addendum to my June 24 report is to compare the prediction accuracy of the three-year lag with the other methodologies discussed in the report. As discussed in the report, the three-year lag had been CMS's traditional method for projecting hospital cost-per-case inflation, but could not be used for FY 2003 since FY 2000 cost report data are not yet available. If CMS were to adhere as closely as possible to its traditional method, it would be forced to use a four-year lag, which it rejected. The June 24 report discussed four alternative projection methodologies: (1) the proposed CMS method for FY 2003 (i.e., four-year moving average of the differences in annual rates of change in cost); (2) a simple four-year moving average of the annual rates of change; (3) a four-year lag in the annual rates of change; and (4) the hospital market basket. The report concluded that the market basket should be used to project cost inflation between FY 2001 and FY 2003 if CMS continues to oppose using the four-year lag.

As will be discussed below, it appears that the four-year lag does not differ substantially from the three-year lag in prediction accuracy, although the latter is marginally superior. I conclude that CMS would lose little, if any, prediction accuracy relative to its traditional method by using the four-year lag for FY 2003. Of all methods considered, however, the market basket exhibits the closest relationship with actual cost increases.

THE ANALYSIS

Table 1 presents the basic historical data, and predictions for three of the methods discussed in the report and the three-year lag. The simple moving average of the annual rates of change is not included here since it was largely dismissed as a projection technique.

TABLE 1
ACTUAL AND PROJECTED
ANNUAL RATE OF CHANGE IN COST PER CASE
AND MARKET BASKET

Year	Actual	Predicted: CMS Method*	92 Market Basket**	Four Year Lag***	Three Year Lag****	97 Market Basket*****
1984	1.018		1.049			
1985	1.110		1.039			
1986	1.096		1.039			
1987	1.091		1.035		1.018	
1988	1.090		1.047	1.018	1.110	
1989	1.092		1.055	1.110	1.096	
1990	1.082		1.045	1.096	1.091	
1991	1.070	1.135	1.044	1.091	1.090	
1992	1.046	1.070	1.032	1.090	1.092	
1993	1.012	1.090	1.031	1.092	1.082	
1994	0.989	1.066	1.026	1.082	1.070	
1995	0.988	1.036	1.031	1.070	1.046	1.028
1996	0.970	0.978	1.024	1.046	1.012	1.023
1997	1.004	0.907	1.021	1.012	0.989	1.016
1998	1.024	0.881	1.029	0.989	0.988	1.027
1999	1.024	0.928	1.025	0.988	0.970	1.027
2000		1.042	1.036	0.970	1.004	1.033
2001		1.055	1.041	1.004	1.024	1.042
2002		1.065	1.028	1.024	1.024	1.037
2003		1.079	1.030	1.024		1.033
2001-2003		***1.150***	***1.059***	***1.048***		***1.071***

* Three-year moving average of differences in annual rates of change.
**Market Basket based on FY 1992 weights.
***Projected annual rate of change for year $_{t}$ equals the rate of change for year $_{t-4}$.
****Projected annual rate of change for year $_{t}$ equals the rate of change for year $_{t-3}$.
***** Market Basket based on FY 1997 weights, proposed for FY 2003.

Sources:

Annual percent change in cost per case: (1) Prospective Payment Assessment Commission, *Medicare and the American Health Care System: Report to Congress*, June 1997, p. 129; (2) Medicare Payment Advisory Commission, *Report to The Congress: Medicare Payment Policy*, March 2001, p. 170; (3) Medicare Payment Advisory Commission, *Report to The Congress: Medicare Payment Policy*, March 2002, p. 146; and (4) *Proposed Rules, Federal Register*/ Vol. 67, No. 90/ May 9, 2002, p.31511.

Market Basket: Prospective Payment Assessment Commission, *op. cit*., and Federal Register, *op. cit*., p. 31445.

Figure 1 shows actual historical data from 1991 to 1999, along with predictions based on the market basket, the four-year lag and the three-year lag. Note that the market basket continues to perform better than the other methods. The three-year lag, however, more closely tracks the actual data than the four-year lag, with the exception of 1999.

To further assess the differences in the two lag approaches, a regression equation was estimated, where the dependent variable is the actual rate of change from 1991 to 1999, and the independent variable is the three–year lag over this same period. The results are shown in Table 2. Table 3 shows the regression results where the independent variable is the four-year lag.[1] Comparison of the two regressions suggests that the three-year lag has only a marginally more significant relationship with actual costs, although neither equation meets acceptable levels of statistical significance. The three-year lag has a significance level of 0.38, compared to 0.72; both are a far cry from 0.05. In contrast, the market basket has a significance level of 0.024, as shown in Table 4.[2] Thus, from a statistical perspective, the market basket is the preferred cost-projection method.

[1] This is Table A4 in the June 24 report.
[2] This is Table A3 in the June 24 report.

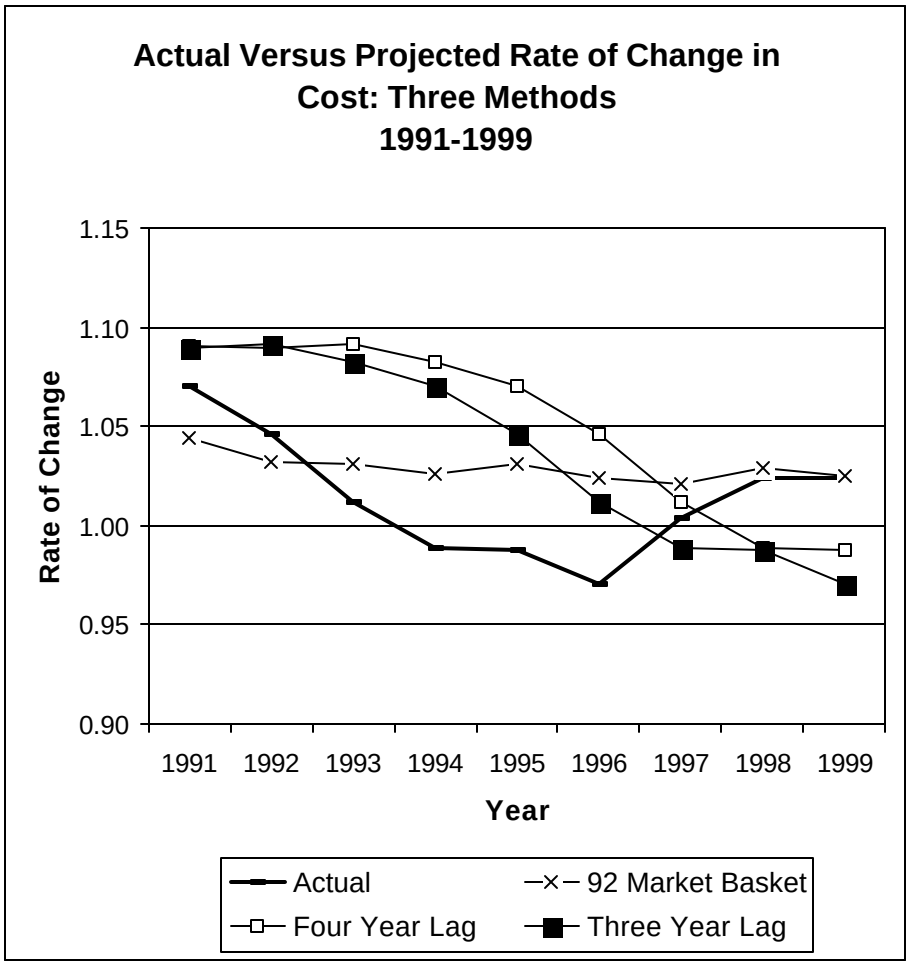

Figure 1

TABLE 2
REGRESSION OF ACTUAL RATE OF CHANGE IN COST PER CASE AGAINST THE THREE-YEAR LAG
1991-1999

Dependent Variable: ACTUAL
Method: Least Squares
Date: 06/26/02 Time: 16:19
Sample: 1991 1999
Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
THREE_YEAR	0.212634	0.227754	0.933611	0.3816
C	0.793446	0.236562	3.354067	0.0122

R-squared	0.110730	Mean dependent var	1.014089
Adjusted R-squared	-0.016308	S.D. dependent var	0.031013
S.E. of regression	0.031265	Akaike info criterion	-3.899532
Sum squared resid	0.006842	Schwarz criterion	-3.855705
Log likelihood	19.54790	F-statistic	0.871629
Durbin-Watson stat	0.595388	Prob(F-statistic)	0.381581

TABLE 3
REGRESSION OF ACTUAL RATE OF CHANGE IN COST PER CASE AGAINST THE FOUR-YEAR LAG
1991-1999

Dependent Variable: ACTUAL
Method: Least Squares
Date: 06/19/02 Time: 13:52
Sample: 1991 1999
Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FOUR_YEAR	0.097541	0.263883	0.369635	0.7226
C	0.911563	0.277587	3.283885	0.0134

R-squared	0.019145	Mean dependent var	1.014089
Adjusted R-squared	-0.120977	S.D. dependent var	0.031013
S.E. of regression	0.032835	Akaike info criterion	-3.801508
Sum squared resid	0.007547	Schwarz criterion	-3.757680
Log likelihood	19.10679	F-statistic	0.136630
Durbin-Watson stat	0.573569	Prob(F-statistic)	0.722583

TABLE 4
REGRESSION OF ACTUAL RATE OF CHANGE IN COST PER CASE AGAINST THE MARKET BASKET
1991-1999

Dependent Variable: ACTUAL
Method: Least Squares
Date: 06/19/02 Time: 13:52
Sample: 1991 1999
Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MARKET_BASKET01	3.417531	1.192879	2.864944	0.0242
C	-2.503310	1.227761	-2.038924	0.0808

R-squared	0.539713	Mean dependent var	1.014089
Adjusted R-squared	0.473958	S.D. dependent var	0.031013
S.E. of regression	0.022493	Akaike info criterion	-4.558082
Sum squared resid	0.003542	Schwarz criterion	-4.514255
Log likelihood	22.51137	F-statistic	8.207901
Durbin-Watson stat	1.076074	Prob(F-statistic)	0.024166