

Physician Volume & Intensity Response

Memorandum

Note: Selected content on this document is licensed for use by the Centers for Medicare & Medicaid Services (CMS). CMS does not have the right to authorize use or redistribution of this content. If you are interested in using the copyrighted material, you must contact the copyright owner directly.

CPT codes and descriptions only are © 1998 American Medical Association. All Rights Reserved. Applicable FARS/DFARS apply.

Date: August 13, 1998

From: Volume-and-Intensity Response Team, Office of the Actuary, HCFA

Subject: Estimated Volume-and-Intensity Response to a Price Change for Physicians' Services

To: Richard S. Foster, Chief Actuary

I. Introduction

Among other functions, The Office of the Actuary has the responsibility to (a) estimate the financial effects of legislative or regulatory changes, and (b) assess budget neutrality in rate setting. Central to both jobs is the determination of our best estimate of the impact on Medicare expenditures when Medicare prices change. Our task is all the more challenging because of some of the special features of health care services.

In a normally functioning competitive market, a decline in the prices that purchasers are willing to pay for a given service can be expected to result in a decrease in the quantity of such services that suppliers would be willing to furnish, and thus a decline in overall expenditures on these services. The reaction to reductions in Medicare physician fees has generally not followed this pattern. Rather, reduced fees are likely to be met by a combination of an increase in volume and a shift in the mix or intensity of services furnished to Medicare beneficiaries.

There are at least three key characteristics of the market for medical services which tend to encourage this response. First, patients often have very little information about the nature of care which they require. Second, patients (including Medicare beneficiaries) directly bear very little of the cost of services furnished, and thus have little incentive to monitor costs or question the necessity of services. Third, uncertainties in the practice of medicine allow for alternative practice styles within and across areas (e.g., two nearby cities may have very different rates of coronary artery bypass surgery). As a result, physician practice modes vary widely.

Because medicine is complicated and patients generally do not have detailed information about the types of services they are purchasing or their own needs, the physician serves as an "agent" for the patient, assessing the patient's diagnoses, selecting the appropriate mix of services and balancing cost considerations against the benefit which the patient will derive. However, the physician may not be able to serve as a perfect agent for the patient, especially given variations in practice styles: within the scope of acceptable practice, the physician's recommendations about services to be furnished could also have an effect of the physician's income.

These characteristics of medical services often give physicians substantial latitude in recommending services toward areas where fees appear more attractive, and/or to increase the volume of services furnished. This discussion is not intended to be a commentary on the ethics of such behavior or whether it differs in any significant way from other professions. Our intent is to understand the reasons such behavior might occur in the provision of medical care services.

This discussion does not intend to imply that patients are uninvolved bystanders having no impact on the volume and/or intensity of services provided. Clearly patients initiate contact with physicians. And the cost of medical care services can influence a patient's decision about whether or not to have such services furnished. Thus, changes in Medicare's prices of services can have an effect on beneficiary demand. A reduction in price would translate into a reduction in out-of-pocket expenses for the beneficiary through lower coinsurance. Lower out-of-pocket expenses could result in an increase in the demand for services.

Whether a response to Medicare price changes occurs because of behavior by physicians or beneficiaries or both is not material for our purposes. We are only concerned with the aggregate response to Medicare price changes.

To this point, for both pricing legislative changes and rate setting, we have generally used a model that assumed that 50 percent of the reduced Medicare revenue to physicians would be offset through increases in the volume and intensity of services. In addition, we assumed no response to payment increases (i.e., no reduction in the volume and intensity of services if Medicare fees are raised). There is often misunderstanding and mischaracterization of our model. As an example of how the model works, suppose Medicare price changes caused a particular physician practice that formerly received \$10,000 in Medicare revenues to now receive \$9,000. Then we would assume that 50 percent of their \$1,000 loss, or \$500, would be offset through increased volume and intensity of Medicare services. This does not mean that there is a 50 percent reduction in Medicare payment rates, as is often alleged. Volume-and-intensity changes are also assumed to occur in response to Medicare provisions affecting the aggregate revenue of other health care providers.

Our customary 50 percent offset assumption has been based on studies which have established a connection between Medicare payment reductions and volume increases. Many of those studies observed a volume-and-intensity response when Medicare physician expenditures were growing rapidly prior to the start of the Medicare fee schedule. Now that the Medicare fee schedule is in effect and that Medicare physician expenditures are growing less rapidly, we have reviewed our model of volume-and-intensity response to price changes.

Our analyses, together with several independent research studies, indicate that there is a statistically significant relationship between Medicare price reductions for physicians' services and partially offsetting increases in the volume and intensity of such services. These results also suggest that the magnitude of this relationship may have decreased over time, possibly in response to the changes in Medicare's reimbursement mechanism. Based on this evidence, we are recommending a 30 percent volume-and-intensity response assumption to price reductions for future financial estimates and for establishing Medicare reimbursement rates for physician services. There continues to be minimal evidence supporting a volume-and-intensity response to price increases.

II. Illustration

In actual practice, there is substantial evidence of volume-and-intensity responses to price changes. We have selected two specific physician practices and their actual 1994 and 1996 Medicare claims data for the following examples. Table 1 is a simple example of how an orthopedic surgeon from Illinois maintained a substantial portion of his or her Medicare revenue, even after a significant Medicare price reduction, by increasing volume. The number of visits billed increased 84 percent while there was only a small increase in the number of surgical services provided. Obviously the volume of some services such as office visits and laboratory tests are more easily controlled by the physician than other services such as surgical procedures.¹ (Attachment 1 shows a full listing of this practice's Medicare billing in 1994-1996.)

¹ In this example and the others used in this memo, price change is calculated based on the actual mix of services performed in 1994 and the specific changes in Medicare fees in the area for each service. Changes in allowed charges will also reflect changes in the volume of each type of service.

Table 1 - Analysis of an orthopedic surgery practice

Type of Service	Allowed Charges		Allowed Services		Price change	Volume change
	1994	1996	1994	1996		
Procedures	\$38,430	\$27,890	29	34	-27%	17%
Visits	\$4,555	\$9,773	45	83	14%	84%
Tests	\$465	\$228	5	5	-55%	0%
TOTAL	\$43,451	\$37,891	79	122	-23%	54%

Physicians could also increase their Medicare revenue by increasing the intensity of the services that they provide. That is, they could substitute higher-priced services for lower-priced services. This practice is very apparent when examining the billings for physician visits. The procedure codes for different types of visits have different reimbursement levels depending on the comprehensiveness of the examination and history and the level of medical decision making involved. The average level of procedure code billed has been increasing over time and is more frequently observed in physician practices that have had price reductions. In addition, there has been a shift in the billing of visit codes from less expensive office visits to more expensive consultations.

Table 2 is an illustration of how a physician practice can offset revenue lost due to payment reductions by increasing the intensity of services they provide. This table displays the Medicare services performed by a particular ophthalmology practice in North Dakota in 1994 and 1996. Due to the reductions in the payments for eye procedures, most notably cataract surgery, the practice incurred a 17 percent price decrease. However, the revenue that this practice received from Medicare was only reduced by 4 percent. The price cut was largely counteracted by increases in volume and intensity. In particular, the intensity change in office visits generated a 63 percent increase in revenue from that type of service. (Attachment 2 shows a full listing of this practice's Medicare billing in 1994-1996.)

Table 2 - Analysis of an ophthalmology practice

Type of Service	Allowed Charges		Allowed Services		Price change	Volume change	Intensity change
	1994	1996	1994	1996			
Eye Procedures	\$296,922	\$239,058	350	379	-24%	8%	-2%
Office Visits	\$38,099	\$69,773	1,097	1,182	5%	8%	63%
Specialist	\$32,016	\$39,851	717	860	12%	20%	-7%
Echography	\$15,509	\$16,852	205	226	1%	10%	-2%
Minor Procedures	\$618	\$1,936	11	27	31%	139%	-6%
TOTAL	\$383,163	\$367,470	2,381	2,674	-17%	12%	3%

In table 3, the office visit intensity change from table 2 is examined in more detail. This particular example portrays how a physician can increase his or her revenue without increasing volume. The total allowed charges for these office visits nearly doubled even though the price increase was only 5 percent and the volume increase was only 8 percent. Note in particular that code 99203 new visits (at \$52.48 each) virtually ceased from 1994 to 1996 while code 99204 new visits (at \$79.80 each) increased by a roughly comparable number. Similarly, substantial reductions in the number of return visits (codes 99211-99214) with lower reimbursement levels were matched almost exactly by the increase in the number of code 99215 visits at a much higher reimbursement level. This phenomenon of generating additional Medicare revenue by increasing the intensity of office visits performed or other categories of services is referred to as upcoding.

Table 3 - Illustration of office visit upcoding

Procedure code	Description	Price per visit 1994	Allowed Charges		Allowed Services		Price change	Volume change
			1994	1996	1994	1996		
99201	Office Visit, New	\$24.46	\$0	\$175	0	7	2%	—
99202	Office Visit, New	\$37.05	\$92	\$240	2	6	8%	200%
99203	Office Visit, New	\$52.48	\$5,136	\$333	98	6	6%	-94%
99204	Office Visit, New	\$79.80	\$292	\$12,371	4	149	4%	3625%
99205	Office Visit, New	\$96.54	\$0	\$1,047	0	10	8%	—
99211	Office Visit, Estab	\$11.73	\$680	\$598	58	50	2%	-14%
99212	Office Visit, Estab	\$20.16	\$5,802	\$2,938	288	135	8%	-53%
99213	Office Visit, Estab	\$29.30	\$12,862	\$6,458	439	210	5%	-52%
99214	Office Visit, Estab	\$47.23	\$3,769	\$669	80	14	1%	-83%
99215	Office Visit, Estab	\$73.44	\$9,465	\$44,946	129	595	3%	361%
TOTAL			\$38,099	\$69,773	1,097	1,182	5%	8%

While increases in the volume and intensity of physician services may be warranted for medical reasons, these data also illustrate a probable causal relationship between price reductions and increases in volume and intensity.

III. Studies on Physician Behavioral Responses

Several studies have been performed to investigate the issue of physicians' behavioral responses to changes in Medicare fees. One such study used Medicare claims in the state of Colorado to attempt to measure a "volume offset" to price reductions (Christensen, 1992). The analysis was conducted using data on payments to general practitioners and internists from 1976 to 1978. This time period was selected because there were significant price changes to these two specialty groups beginning in 1977. Regression equations were utilized to determine if a certain change in price had an effect on the volume of services performed by physician practices in the area. The estimate controlled for other factors that could affect the volume of physician expenditures, such as experience, certifications, gender, health sector wages, number of physicians, etc. Christensen concluded that in aggregate about half of a price decrease would be offset by a volume increase and about one third of a price increase would be offset by a volume decrease.

A longitudinal study of a panel of physicians in New York and Washington for 1987 through 1989 analyzed the affects of Medicare price reductions on the volume and intensity of Medicare services provided, as well as the effects on the private sector (Yip, 1994). The first section of the report examines coronary artery bypass graftings (CABG) which received Medicare price reductions as a result of Omnibus Budget Reconciliation Act (OBRA) of 1987 during this period. Yip found a large and statistically significant increase in the volume and intensity of the CABGs performed in response to this price cut. The second section of the report examines ten other procedures affected by the OBRA 1987 legislation. Yip did not find a significant volume-and-intensity response for these procedures. The final section of the report looks at the entire episode of care associated with performing a CABG. The results showed an increase in the billings for the other component services associated with the CABG episode, thereby augmenting the volume and intensity response to the price reduction.

Another study of physician behavioral responses to Medicare price changes was conducted to ascertain the effects of Medicare fee reductions imposed in OBRA 1989 (Nguyen and Derrick, 1997). This study used Medicare physician data for 1989 and 1990 for individual physician practices. For the price variable, the authors used a Fisher Index of the Medicare average allowed charges. The results of using this model estimate the volume response to a price change as twofold. First, the estimated behavioral response was statistically significant only for those practices receiving a price reduction. The magnitude of this response was about 40 percent. The authors concluded that the estimated behavioral response for those practices not receiving a price decrease was insignificant. The limitation of this latter finding is that there were no practices that received a price increase, only practices that had no change in price. The second finding was that the behavioral response seemed to vary by specialty groups. They concluded that some specialty groups may have more opportunities to increase volume than others.

The Physician Payment Review Commission (PPRC, now MedPAC) examined data from 1991 and 1992 in an attempt to measure the effect of price changes on the quantity of services delivered (PPRC, 1993). Regression

analysis was performed using price decreases to predict the growth in the volume of services. Because there were few price increases during this period, there was no analysis of price increases. For this study, each observation consisted of aggregate Medicare reimbursement for a physician specialty within a Medicare carrier. The average offset determined from this investigation was 36 percent. Previously, PPRC had done similar studies to measure the volume response of Medicare price reductions resulting from OBRA 87 and OBRA 89 (PPRC 1991 and 1992). The volume response from these studies was estimated to be between 30 percent and 40 percent. In addition, the volume responses were found by these studies to decrease over time.

Another study of behavioral responses to Medicare price changes was conducted in order to examine the effects of the implementation of the Medicare physician fee schedule (Verrilli and Zuckerman, 1995). It examined national trends in the volume and intensity of physicians' services per beneficiary for the years 1986-1991 and 1991-1992. Annual changes were presented by broad type of service group. In addition, these same annual changes were examined for three impact groups; "gainers," "small losers," and "large losers." The impact groups were subdivided by Medicare payment localities. These impact groups were based on the long-run impact of the fee schedule on payments per service as estimated by HCFA. The study demonstrated that the growth in the volume and intensity of Medicare physicians' services slowed during the first year of the fee schedule when compared to the five years prior to implementation. Verrilli and Zuckerman concluded that there was insufficient evidence of a behavioral response to price changes by type of service. However, a significant limitation of this study was the attempt to measure behavioral response by type of service as opposed to analyzing the billing practices of individual physicians.

The majority of these studies looked at the volume-and-intensity response to price decreases only, and did not consider potential changes in response to price increases. Another limitation of these studies is that most of the analyses were done on physician claims data before the implementation of the Medicare fee schedule. Evidence suggests that growth in physician volume and intensity has slowed since the fee schedule began in 1992. The volume and intensity of services grew by an average of 7.1 percent in the ten years preceding the Medicare fee schedule and by an average of 3.5 percent in the five years since. Therefore, the introduction of the Medicare fee schedule may have affected the level of volume-and-intensity growth and/or the volume-and-intensity response to a price change.

IV. The OACT Study

Our study used data on Medicare expenditures for a five percent sample of physicians from 1994 through 1996. This time period was selected for three reasons. First, in addition to being the most recent data available, it reflects experience under the Medicare physician fee schedule. This is desirable because the fee schedule also entailed a uniform set of payment policies. Second, beginning in 1994, Medicare supplied its carriers with the exact prices paid for each procedure. Prior to 1994, the carriers determined the price that was paid based on a formula specified in law. However, some of the prices were not computed correctly. Accurate price information is integral to any analysis of the effects of price changes on volume and intensity. Finally, there are both increases and decreases in Medicare payments in these years because Medicare physician payments were transitioned from the prior reimbursement mechanism to the fee schedule from 1992 to 1996. Having significant price changes, in both directions, provides an excellent basis to analyze response to price changes.

The actual prices paid by Medicare for each procedure and each practice were then aggregated for each practice. Price indices were calculated for each practice based on their mix of services in 1994, using the Lespeyres index methodology. Change in volume and intensity is measured by the aggregate increase in expenditures less the price index. Additional variables that could possibly affect the volume and/or intensity increases were gathered for every locality. These variables included: fee-for-service enrollment, hospital admissions, number of physicians, population, personal income, unemployment, inpatient hospital days, hospital beds, and number of hospitals.

While analyzing the physician practice data, we noticed that some physicians were billing for a disproportionately large number of services. We concluded that multiple physicians must have been using the same "unique provider identification number" (UPIN) to bill Medicare. To eliminate this problem, the expenditures were aggregated at the locality level by specialty. (Locality is the smallest level for which Medicare determines unique prices through the geographic adjustments.)

Using the available information, regression models were specified to test both a symmetric response as well as an asymmetric response² using the same methodology as in the Nguyen and Derrick study (Nguyen and Derrick, 1997). For the asymmetric model, the price changes were adjusted for the growth in the Medicare Economic Index, and the observations with price increases were considered separately from the observations with price decreases. The only variables that were significant in predicting volume and intensity growth were price changes and the change in fee-for-service enrollment. All of the other variables were found to be insignificant. Therefore, the models used in this study are:

Symmetric: $VI = a_1 + a_2 \times FFS + a_3 \times P$

Asymmetric: $VI = a_1 + a_2 \times FFS + a_3 \times P + a_4 \times (P \times D) + a_5 \times D$

where:

VI = change in the volume and intensity of services

FFS = change in fee-for-service enrollment

P = change in price

D = dummy variable (1 for price increases, 0 for price decreases)

Table 4 shows the results of the regression analyses. Both the symmetric model and the asymmetric model found statistically significant offsets to price changes. The results of the symmetric model yielded a 23 percent volume-and-intensity response for all specialties. The volume-and-intensity response from the regression on medical specialties only was 34 percent. The symmetric regression on surgical specialties did not yield significant results. For the asymmetric model, the volume-and-intensity response to price decreases for all specialties was 31 percent. The volume-and-intensity response to a price increase was not statistically significant, indicating that it may not be different than the volume-and-intensity response to a price decrease. The regressions on medical specialties and surgical specialties for the asymmetric model produced similar results. (Attachment 3 shows the details of the regression analyses.)

Table 4 - Estimated Change in Volume and Intensity of Physician Services Resulting from a Price Change

	Symmetric Response		Asymmetric Response		
	<i>All Observations</i>		<i>Price Decrease</i>		<i>Price Increase</i>
All Specialties (1994-1996)	23%	significant at the 5% level	31%	significant at the 5% level	13%
Surgical Specialties (1994-1996)	10%		29%	significant at the 10% level	22%
Medical Specialties (1994-1996)	34%	significant at the 5% level	30%	significant at the 5% level	23%
All Specialties (1994-1995)	12%		-14%		18%
All Specialties (1995-1996)	32%	significant at the 5% level	32%	significant at the 5% level	38%

If we examine the regression equations for 1994-1995 and 1995-1996 separately, we can observe that the equations for 1994-1995 were not significant for either the symmetric model or the asymmetric model, yet the 1995-1996 experience was similar to that of the overall 1994-1996 experience. We believe the difference between the two periods is attributable to the Medicare Volume Performance Standard (MVPS) bonus/penalty system. In 1995, there was an average bonus of 7.5 percent, and surgical procedures (which suffered the greatest fee decreases in the transition to the full fee schedule) received a 12.8 percent bonus. In contrast, the average *penalty* in 1996 was 1.2 percent. Because of the impact of the MVPS bonus/penalty, the 1994-1995 physician data reflects a large proportion of practices that received price *increases*, (73 percent) and very few that received price decreases, (27 percent). The 1995-1996 experience is just the opposite: 87 percent of the practices received price *reductions*. Since the regression on the 1994-1995 experience, which contained mostly price increases, was not significant, this leads us to believe that there is no discernable volume-and-intensity response for practices with price increases and therefore the

² The “symmetric” models test whether comparable volume-and-intensity changes would occur in response to either relative price increases or decreases. “Asymmetric” models allow for unequal responses. In either case, the null hypothesis is that there is no behavioral response. In statistical tests of this type, the “burden of proof” is on the data to show that any measured relationship is significantly different from zero. Thus, the null hypothesis is assumed to be met unless the regression coefficients are so different from zero that it could not happen by random chance except p% of the time, where p is the critical value for the statistical test (typically 5%).

asymmetric regression is more appropriate. Furthermore, specific incidences of volume and/or intensity increases (illustrated earlier) were far more prevalent among practices with price reductions.

An analysis was done on each specialty individually in an attempt to ascertain whether the volume-and-intensity response varied by specialty. Unfortunately, the price changes within the majority of the specialties were very similar. This made it difficult to get significant regression results.

In addition, we performed various analyses looking separately at practices that had overall price decreases versus those that had price increases. The results for practices with price decreases were similar to the results in table 4, with statistically significant response coefficients in the range of 30 percent. The results for practices that had price increases were statistically insignificant, meaning that the volume-and-intensity response was not significantly different from zero. These regressions were run (a) fully separately (i.e., first on data for practices with price increases and then on the remaining practices), and (b) using a combined model specification.³ The results were the same in each case. The combined model specification is shown below and the detailed regression output is shown in attachment 4.

$$\text{Asymmetric: } VI = a_1 + a_2 \times \text{FFS} + a_3 \times (P \times D1) + a_4 \times (P \times D2) + a_5 \times D2$$

where:

VI = change in the volume and intensity of services

FFS = change in fee-for-service enrollment

P = change in price

D1 = dummy variable (0 for price increases, 1 for price decreases)

D2 = dummy variable (1 for price increases, 0 for price decreases)

As noted above, the two approaches to testing for an asymmetric response lead to identical statistically significant conclusions regarding the existence of a volume-and-intensity response to price decreases. For price increases, however, the two approaches produce indeterminate results. The asymmetric models in table 4 fail to reject the hypothesis that the response to price increases is equal in magnitude to that for price decreases. The separate models fail to reject the hypothesis that there is zero response to price increases. Qualitatively, the strong response identified in the data for practices with price decreases, contrasted to the indeterminate response for price increases, further supports the view that there is an asymmetric response to price changes.

Since the asymmetric model found statistically significant results for all specialties with a price decrease, and similar results were attained from the regressions performed on medical specialties and surgical specialties separately, we recommend use of a 30 percent volume-and-intensity response to Medicare a price decrease for physicians' services. Since the volume-and-intensity response to a Medicare price increase was indeterminate, we continue to recommend no behavior offset for Medicare price increases.

V. Further Research

While significant evidence exists to support the view that behavioral responses occur in practice, uncertainty remains as to the extent, magnitude, etc. The regression analysis showed the statistical significance of Medicare price decreases on volume and intensity, but it failed to explain a large part of the total variation in volume-and-intensity changes over time. Also, our study was conducted using only two years worth of price changes. Therefore it would be desirable to continue studying behavioral responses. In particular, this issue could be reanalyzed using the 1997-1998 experience when it becomes available. In 1998, Medicare changed from three separate physician fee conversion factors back to a single conversion factor. This change created variations in Medicare price changes for physician practices similar to the 1994-1996 experience, again forming a solid database for analysis of both positive and negative price changes in volume and intensity.

³ Mathematically, the two approaches are equivalent, with the exception of the assumed probability distribution for the error term of the model. The combined specification assumes a common distribution for both types of physician practices, whereas the regressions on separate data permit the error distribution to differ between the two types.

In 1998, the payment mechanism for Medicare physicians' services was also substantially changed in another respect. Under the Balanced Budget Act of 1997, the MVPS was replaced by the Sustainable Growth Rate (SGR) system. There are two major differences between the MVPS and the SGR that are integral to this discussion. The first is the way the behavioral offset to any payment penalties is handled. Under the MVPS, the assumed behavior response to an MVPS penalty was included in the calculation of a future allowed increase. By law, this does not occur under the SGR system. The second difference lies in the allowed volume-and-intensity increase. This increase in the MVPS was equal to the average increase in the volume and intensity of services for the previous five years. Therefore, if the volume and intensity of physicians' services increased, there would be a larger Medicare allowance for the volume and intensity of services in the future. With the SGR system, the allowed volume-and-intensity increase is equal to the increase in real per capita Gross Domestic Product (GDP), eliminating the link to the previous years' increases in volume and intensity. These two differences notably change the long-term financial incentive for physicians to increase their volume and intensity.

In addition to continuing the study, an attempt could be made to add more explanatory variables to the regression analysis. Ideally, the study would contain revenue information on the entire physician practice, not just the Medicare physician reimbursement. Any behavioral response is probably not confined to the practice's Medicare revenues, but more likely also includes recouping some of the lost income by increasing their private insurance revenues. While this method of recovering lost income is not relevant for determining the impact of legislative proposals on Medicare, the additional data may improve the results of the regression equation by explaining a greater portion of the variability in volume-and-intensity growth.

VI. Conclusion

Our analysis of the Medicare volume-and-intensity responses resulting from a reduction in Medicare's physician fees suggests that practices experiencing such reductions might try to avoid or minimize revenue reductions by making offsetting changes. This possibility may be augmented by the tendency for beneficiaries to accept or seek more services when their cost-sharing is reduced as a result of lower allowable charges.

In practice, there exists considerable anecdotal evidence of behavioral responses by physician practices to price reductions. Incidences of upcoding and volume increases tend to be much more common among physician practices receiving price cuts. These apparent behavioral responses can have a marked effect on the Medicare reimbursements for individual practices and can also affect total Medicare expenditures for physicians' services. Therefore, we must consider this effect when determining the impact of legislative proposals, when projecting Medicare expenditures under present law, and when establishing Medicare payment rates where the law specifies budget neutrality.

More important than the anecdotal evidence, formal statistical studies consistently find significant evidence supporting the hypothesis of a volume-and-intensity response to physician fee reductions. The independent studies summarized in this memorandum, as well as our own analysis, suggest that in aggregate, physicians will increase the volume and intensity of Medicare claims in such a way as to offset between 30 percent and 50 percent of the revenue reductions that would otherwise result from decreases in Medicare fees. Minimal evidence has been found to support a hypothesis of reduced volume and intensity in response to fee increases.

The available evidence also supports the view that the behavioral response may be decreasing over time. This may be due to random chance, or more likely may reflect the changes in the payment mechanism for Medicare physicians' services. The studies conducted after the Medicare fee schedule was implemented in 1992 estimated the volume-and-intensity response to price reduction to be between 30 percent and 40 percent. The estimates from our own study were about 30 percent.

Because of the apparent downward trend in the behavioral response to price reductions, and the change in the incentives for such a response due to the implementation of the SGR system, we recommend a 30 percent behavioral offset to price reductions for future cost estimates involving physician payments. As always, this assumption should be used only as a guideline, and may be modified on individual proposals or determinations if appropriate.

Suzanne M. Codespote, ASA
Actuary

William J. London, ASA
Actuary

John D. Shatto, ASA
Actuary

References

Christensen, Sandra. "Volume Responses to Exogenous Changes in Medicare's Payment Policies: Technical Memorandum," Congressional Budget Office, August 1989

Nguyen, Nguyen Xuan, and Frederick William Derrick. "Physician Behavioral Response to a Medicare Price Reduction," Health Services Research, August 1997

Physician Payment Review Commission, Annual Report to Congress, April 1993

Physician Payment Review Commission, Annual Report to Congress, April 1992

Physician Payment Review Commission, Annual Report to Congress, April 1991

Verrilli, Diana, and Stephen Zuckerman. "Trends in Volume and Intensity of Physician Services under the Medicare Fee Schedule," The Urban Institute, January 1995

Yip, Winnie Chi-man. "Physician Response to Medicare Fee Regulations," doctoral dissertation, Massachusetts Institute of Technology, May 1994

Attachment 1

Note: Selected content on this document is licensed for use by the Centers for Medicare & Medicaid Services (CMS). CMS does not have the right to authorize use or redistribution of this content. If you are interested in using the copyrighted material, you must contact the copyright owner directly.

CPT codes and descriptions only are © 1998 American Medical Association. All Rights Reserved. Applicable FARS/DFARS apply.

ORTHOPEDIC SURGERY

upin=

HCPC	Allowed Charges			Price			Allowed Services		Price Increase	Vol & Intens Increase
	1994	1995	1996	1994	1995	1996	1994	1996		
10180	134.22	0.00	0.00	134.22	146.55	148.68	1	0	1.108	0.000
11042	0.00	38.15	0.00	79.02	83.77	80.13	0	0	1.014	0.000
20005	73.07	0.00	0.00	146.13	192.00	223.08	1	0	1.527	0.000
20225	307.88	194.52	169.36	205.25	194.52	169.36	2	1	0.825	0.667
20250	0.00	0.00	230.22	500.57	508.78	460.44	0	1	0.920	0.000
20251	0.00	267.54	262.81	489.57	535.08	525.61	0	1	1.074	0.000
20610	0.00	138.84	189.40	42.22	46.28	47.35	0	4	1.122	0.000
20680	0.00	166.38	0.00	318.05	332.76	311.79	0	0	0.980	0.000
20926	78.44	0.00	0.00	313.75	341.92	347.07	0	0	1.106	0.000
20937	0.00	0.00	777.09	0.00	0.00	259.03	0	3	1.000	0.000
21925	279.95	0.00	140.69	279.95	295.64	281.37	1	1	1.005	0.500
22112	0.00	0.00	507.11	925.09	1,003.52	1,014.22	0	1	1.096	0.000
22114	545.67	430.11	435.76	790.82	860.21	871.52	1	1	1.102	0.725
22142	2,076.96	2,774.78	0.00	3,010.08	2,774.78	2,197.83	1	0	0.730	0.000
22148	335.24	0.00	0.00	335.24	343.23	342.98	1	0	1.023	0.000
22224	0.00	812.15	0.00	1,496.59	1,624.30	1,641.93	0	0	1.097	0.000
22325	0.00	658.02	0.00	1,324.52	1,316.03	1,163.12	0	0	0.878	0.000
22326	371.86	0.00	0.00	1,487.45	1,613.08	1,629.38	0	0	1.095	0.000
22327	0.00	0.00	785.89	1,431.99	1,554.12	1,571.78	0	1	1.098	0.000
22558	2,162.85	0.00	0.00	3,134.57	2,752.09	1,969.30	1	0	0.628	0.000
22585	551.38	0.00	0.00	551.38	568.10	522.31	1	0	0.947	0.000
22590	1,224.95	0.00	0.00	2,449.90	2,335.58	1,962.24	1	0	0.801	0.000
22612	0.00	0.00	4,774.46	2,634.05	2,444.38	1,942.23	0	2	0.737	0.000
22614	0.00	0.00	829.93	0.00	0.00	570.93	0	1	1.000	0.000
22625	5,972.08	4,664.52	0.00	2,388.83	2,332.26	2,002.06	3	0	0.838	0.000
22630	1,086.91	0.00	915.10	2,173.82	2,144.21	1,830.20	1	1	0.842	1.000
22650	794.56	2,184.66	0.00	794.56	728.22	570.93	1	0	0.719	0.000
22802	5,151.17	3,202.13	2,755.10	3,219.48	3,202.13	2,755.10	2	1	0.856	0.625
22820	2,010.16	1,322.16	0.00	502.54	440.72	316.04	4	0	0.629	0.000
22830	517.18	860.01	1,127.45	2,068.70	1,720.01	1,127.45	0	1	0.545	4.000
22842	5,450.52	4,826.16	2,000.91	1,362.63	1,608.72	666.97	4	3	0.489	0.750
22843	0.00	0.00	831.88	0.00	0.00	831.88	0	1	1.000	0.000
22845	0.00	1,470.32	554.40	1,368.97	1,470.32	554.40	0	1	0.405	0.000
22850	0.00	0.00	432.63	859.97	911.03	865.26	0	1	1.006	0.000
29010	565.50	261.71	416.46	282.75	261.71	208.23	2	2	0.736	1.000
29130	0.00	12.33	0.00	24.42	28.21	29.59	0	0	1.212	0.000
63005	1,510.83	797.64	2,258.12	1,510.83	1,595.27	1,505.41	1	2	0.996	1.500
63017	0.00	1,991.82	0.00	1,968.71	1,991.82	1,784.33	0	0	0.906	0.000
63030	0.00	0.00	1,349.32	1,240.03	1,340.55	1,349.31	0	1	1.088	0.000

HCPC	Allowed Charges			Price			Allowed Services		Price Increase	Vol & Intens Increase
	1994	1995	1996	1994	1995	1996	1994	1996		
63035	0.00	0.00	1,576.94	372.80	384.57	352.98	0	4	0.947	0.000
63042	509.79	0.00	0.00	2,039.14	2,111.34	1,945.06	0	0	0.954	0.000
63047	2,548.92	0.00	753.66	2,548.92	2,248.13	1,507.31	1	1	0.591	0.500
63055	3,376.21	1,479.98	0.00	3,376.21	2,959.95	2,148.21	1	0	0.636	0.000
63056	0.00	0.00	1,975.82	1,918.35	2,056.25	1,975.82	0	1	1.030	0.000
63057	793.76	0.00	0.00	793.76	621.76	342.95	1	0	0.432	0.000
63077	0.00	0.00	1,839.67	1,813.88	1,928.58	1,839.67	0	1	1.014	0.000
63087	0.00	1,365.89	0.00	2,507.04	2,731.78	2,674.12	0	0	1.067	0.000
95925	465.47	351.92	227.75	100.84	87.98	45.55	5	5	0.452	1.083
99203	0.00	0.00	54.39	59.47	65.67	64.33	0	1	1.082	0.000
99204	0.00	0.00	177.10	85.81	96.38	96.01	0	2	1.119	0.000
99205	902.43	466.44	0.00	100.27	116.61	119.93	9	0	1.196	0.000
99212	0.00	21.06	0.00	25.09	26.65	25.52	0	0	1.017	0.000
99213	0.00	0.00	57.52	35.78	37.62	36.03	0	2	1.007	0.000
99214	245.80	50.00	100.00	49.16	55.36	55.31	5	2	1.125	0.362
99215	1,200.00	2,450.00	3,795.88	75.48	86.36	87.47	16	43	1.159	2.730
99220	0.00	134.63	265.48	131.23	134.63	132.74	0	2	1.012	0.000
99223	261.34	276.92	687.90	130.67	138.46	137.58	2	5	1.053	2.500
99233	68.56	0.00	0.00	68.56	70.34	69.33	1	0	1.011	0.000
99245	1,405.44	2,746.88	4,103.52	156.16	171.68	176.24	9	23	1.129	2.587
99255	471.45	690.40	531.60	157.15	172.60	177.20	3	3	1.128	1.000
TOTAL	43,450.55	37,108.07	37,891.32				79	122	0.772	1.129

Attachment 2

Note: Selected content on this document is licensed for use by the Centers for Medicare & Medicaid Services (CMS). CMS does not have the right to authorize use or redistribution of this content. If you are interested in using the copyrighted material, you must contact the copyright owner directly.

CPT codes and descriptions only are © 1998 American Medical Association. All Rights Reserved. Applicable FARS/DFARS apply.

OPHTHAMOLOGY

upin=

HCPC	Allowed Charges			Price			Allowed Services		Price Increase	Vol & Intens Increase
	1994	1995	1996	1994	1995	1996	1994	1996		
31239	0.00	0.00	118.60	728.41	772.83	741.24	0	0	1.018	0.000
65400	193.00	0.00	423.18	406.31	444.74	453.14	0	1	1.115	1.966
65420	0.00	0.00	415.00	284.93	311.94	310.00	0	1	1.088	0.000
65430	0.00	0.00	53.43	57.66	58.52	53.46	0	1	0.927	0.000
65450	0.00	0.00	238.48	189.37	223.23	238.48	0	1	1.259	0.000
65750	10,256.83	9,831.36	5,432.35	1,462.83	1,404.48	1,086.47	7	5	0.743	0.713
65855	0.00	1,080.26	404.38	566.46	540.13	404.38	0	1	0.714	0.000
66170	1,128.15	2,190.85	8,545.60	791.68	876.34	880.99	1	10	1.113	6.807
66250	599.74	0.00	0.00	431.31	471.90	480.63	1	0	1.114	0.000
66720	1,131.63	0.00	390.66	397.06	414.57	390.66	3	1	0.984	0.351
66761	0.00	1,513.20	674.10	389.46	378.30	337.05	0	2	0.865	0.000
66821	55,789.50	54,661.12	32,964.20	485.10	413.07	250.86	115	131	0.517	1.143
66840	0.00	0.00	642.00	705.42	711.01	642.16	0	1	0.910	0.000
66940	0.00	784.35	725.32	763.37	784.35	725.32	0	1	0.950	0.000
66984	217,247.60	196,459.00	172,866.80	1,060.38	1,035.06	851.59	205	203	0.803	0.991
66985	0.00	377.72	0.00	754.66	755.45	676.36	0	0	0.896	0.000
66986	786.63	0.00	5,855.30	828.03	906.48	900.98	1	6	1.088	6.841
66999	409.74	0.00	0.00	0.00	0.00	0.00	0	0	1.028	0.000
67005	0.00	1,760.26	0.00	889.65	880.13	646.38	0	0	0.727	0.000
67010	0.00	0.00	317.57	894.92	871.43	635.14	0	1	0.710	0.000
67145	1,050.38	0.00	437.11	552.83	537.44	437.11	2	1	0.791	0.526
67210	0.00	0.00	696.13	618.97	688.61	696.13	0	1	1.125	0.000
67228	7,176.62	9,457.92	7,235.70	686.76	788.16	822.27	10	9	1.197	0.842
67800	0.00	137.14	0.00	75.58	84.83	86.62	0	0	1.146	0.000
67820	131.12	258.06	532.07	34.50	43.01	48.37	4	11	1.402	2.894
67840	285.74	459.08	171.67	98.28	114.77	121.78	3	1	1.239	0.485
67903	0.00	698.21	0.00	732.82	698.21	539.00	0	0	0.736	0.000
67916	772.52	0.00	0.00	406.59	442.48	436.67	2	0	1.074	0.000
67921	379.42	248.63	1,033.02	208.86	248.63	267.88	2	4	1.283	2.123
67961	0.00	587.51	0.00	632.58	587.51	473.73	0	0	0.749	0.000
68110	0.00	0.00	112.00	89.60	105.14	112.00	0	1	1.250	0.000
68200	0.00	35.78	38.01	30.53	35.78	38.01	0	1	1.245	0.000
68440	79.88	227.80	62.20	47.17	56.95	62.20	2	1	1.319	0.591
68760	0.00	91.00	143.46	76.32	91.01	98.47	0	1	1.290	0.000
68761	0.00	80.44	0.00	69.94	80.44	84.11	0	0	1.203	0.000
68800	120.96	78.47	466.48	42.44	52.31	58.31	3	8	1.374	2.807
68830	0.00	188.80	0.00	203.27	188.80	152.49	0	0	0.750	0.000
76511	15,508.80	15,762.95	16,428.15	75.58	77.65	76.41	205	215	1.011	1.048
76511	0.00	0.00	148.60	37.15	37.97	37.15	0	4	1.000	0.000

HCPC	Allowed Charges			Price			Allowed Services		Price Increase	Vol & Intens Increase
	1994	1995	1996	1994	1995	1996	1994	1996		
76511	0.00	0.00	274.82	33.51	37.46	39.26	0	7	1.172	0.000
92002	448.47	195.28	49.38	42.92	48.82	49.38	10	1	1.151	0.096
92004	4,257.75	4,039.12	2,881.20	59.76	69.64	72.03	71	40	1.205	0.561
92012	4,219.74	10,800.35	11,715.67	37.33	40.15	40.54	113	289	1.086	2.557
92014	16,592.08	20,012.60	18,262.00	44.91	49.63	51.42	369	355	1.145	0.961
92020	0.00	0.00	21.04	20.52	21.31	21.04	0	1	1.025	0.000
92070	56.56	183.12	240.07	59.54	61.04	60.07	1	4	1.009	4.207
92083	6,240.75	6,790.22	6,221.92	41.84	42.71	42.04	149	148	1.005	0.992
92235	175.60	0.00	0.00	92.42	87.07	75.65	2	0	0.819	0.000
92250	25.45	27.81	289.74	26.79	27.81	27.43	1	11	1.024	11.119
92285	0.00	0.00	169.84	15.12	15.67	15.44	0	11	1.021	0.000
95858	0.00	84.76	0.00	82.54	84.76	83.67	0	0	1.014	0.000
99201	0.00	26.01	174.58	24.46	26.01	24.94	0	7	1.020	0.000
99202	92.40	40.15	240.36	37.05	40.84	40.06	2	6	1.081	2.406
99203	5,135.58	972.40	333.30	52.48	57.20	55.55	98	6	1.059	0.061
99204	292.43	13,452.56	12,370.83	79.80	86.26	83.10	4	149	1.041	40.624
99205	0.00	1,064.60	1,046.50	96.54	106.46	104.65	0	10	1.084	0.000
99211	679.54	286.81	597.50	11.73	12.47	11.95	58	50	1.019	0.863
99212	5,802.45	1,776.80	2,937.60	20.16	22.21	21.76	288	135	1.079	0.469
99213	12,862.08	8,399.11	6,457.50	29.30	31.82	30.75	439	210	1.049	0.478
99214	3,769.08	993.60	668.64	47.23	49.68	47.76	80	14	1.011	0.175
99215	9,465.08	42,137.94	44,946.30	73.44	78.91	75.54	129	595	1.029	4.617
TOTAL	383,163.30	408,253.15	367,470.36				2,381	2,673	0.831	1.155

Attachment 3

SYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1994 - 1996

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	4.82019	2.4101	63.951	0.0001
Error	2116	79.74489	0.03769		
C Total	2118	84.56509			

Statistic	Value
Root MSE	0.19413
Dep Mean	1.01422
C.V.	19.14093
R-Square	0.057
Adj R-Sq	0.0561

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.407815	0.09160156	4.452	0.0001
FFSINC	1	0.85552	0.07936649	10.779	0.0001
PRICE	1	-0.229888	0.0529594	-4.341	0.0001

ASYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1994 - 1996

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	4.86135	1.21534	32.235	0.0001
Error	2114	79.70374	0.0377		
C Total	2118	84.56509			

Statistic	Value
Root MSE	0.19417
Dep Mean	1.01422
C.V.	19.14504
R-Square	0.0575
Adj R-Sq	0.0557

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.489464	0.12997693	3.766	0.0002
FFSINC	1	0.847524	0.07993047	10.603	0.0001
PRICE	1	-0.306631	0.10238231	-2.995	0.0028
PRICE*DUM	1	0.175857	0.17265652	1.019	0.3085
DUMMY	1	-0.181397	0.18159091	-0.999	0.3179

SYMMETRIC MODEL REGRESSION ON SURGICAL SPECIALTIES 1994 - 1996

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	2.59566	1.29783	36.377	0.0001
Error	998	35.60602	0.03568		
C Total	1000	38.20168			

Statistic	Value
Root MSE	0.18888
Dep Mean	1.01767
C.V.	18.56052
R-Square	0.0679
Adj R-Sq	0.0661

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.170117	0.12973204	1.311	0.1901
FFSINC	1	0.963093	0.11323124	8.506	0.0001
PRICE	1	-0.098097	0.07255819	-1.352	0.1767

ASYMMETRIC MODEL REGRESSION ON SURGICAL SPECIALTIES 1994 - 1996

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	2.71898	0.67974	19.08	0.0001
Error	996	35.4827	0.03563		
C Total	1000	38.20168			

Statistic	Value
Root MSE	0.18875
Dep Mean	1.01767
C.V.	18.54694
R-Square	0.0712
Adj R-Sq	0.0674

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.35415	0.18742348	1.89	0.0591
FFSINC	1	0.955692	0.11338863	8.428	0.0001
PRICE	1	-0.28792	0.1530011	-1.882	0.0602
PRICE*DUM	1	0.068227	0.22679616	0.301	0.7636
DUMMY	1	-0.036653	0.23709411	-0.155	0.8772

SYMMETRIC MODEL REGRESSION ON MEDICAL SPECIALTIES 1994 - 1996**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	1.73343	0.86671	22.804	0.0001
Error	928	35.27039	0.03801		
C Total	930	37.00381			

Statistic	Value
Root MSE	0.19495
Dep Mean	1.00132
C.V.	19.46963
R-Square	0.0468
Adj R-Sq	0.0448

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.649559	0.14101293	4.606	0.0001
FFSINC	1	0.709115	0.12034712	5.892	0.0001
PRICE	1	-0.336706	0.08639856	-3.897	0.0001

ASYMMETRIC MODEL REGRESSION ON MEDICAL SPECIALTIES 1994 - 1996**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	1.7489	0.43722	11.484	0.0001
Error	926	35.25492	0.03807		
C Total	930	37.00381			

Statistic	Value
Root MSE	0.19512
Dep Mean	1.00132
C.V.	19.48637
R-Square	0.0473
Adj R-Sq	0.0431

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.609765	0.19901064	3.064	0.0022
FFSINC	1	0.716737	0.12267466	5.843	0.0001
PRICE	1	-0.300751	0.15158507	-1.984	0.0475
PRICE*DUM	1	0.075541	0.29447259	0.257	0.7976
DUMMY	1	-0.090988	0.31090738	-0.293	0.7699

SYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1994 - 1995**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	0.85354	0.42677	17.196	0.0001
Error	2243	55.66613	0.02482		
C Total	2245	56.51967			

Statistic	Value
Root MSE	0.15754
Dep Mean	1.033
C.V.	15.2504
R-Square	0.0151
Adj R-Sq	0.0142

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.421639	0.14657627	2.877	0.0041
FFSINC	1	0.741122	0.12832816	5.775	0.0001
PRICE	1	-0.122106	0.07970791	-1.532	0.1257

ASYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1994 - 1995**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	0.87694	0.21923	8.83	0.0001
Error	2241	55.64273	0.02483		
C Total	2245	56.51967			

Statistic	Value
Root MSE	0.15757
Dep Mean	1.033
C.V.	15.254
R-Square	0.0155
Adj R-Sq	0.0138

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.153508	0.32628981	0.47	0.6381
FFSINC	1	0.748702	0.12887624	5.809	0.0001
PRICE	1	0.139691	0.3003883	0.465	0.642
PRICE*DUM	1	-0.322295	0.33208016	-0.971	0.3319
DUMMY	1	0.325259	0.33509895	0.971	0.3318

SYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1995 - 1996**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	2.16192	1.08096	47.542	0.0001
Error	2254	51.24933	0.02274		
C Total	2256	53.41125			

Statistic	Value
Root MSE	0.15079
Dep Mean	0.9798
C.V.	15.38971
R-Square	0.0405
Adj R-Sq	0.0396

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.404225	0.12151848	3.326	0.0009
FFSINC	1	0.90173	0.10253427	8.794	0.0001
PRICE	1	-0.321614	0.07184457	-4.477	0.0001

ASYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES 1995 - 1996**ANALYSIS OF VARIANCE**

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	2.16257	0.54064	23.757	0.0001
Error	2252	51.24867	0.02276		
C Total	2256	53.41125			

Statistic	Value
Root MSE	0.15085
Dep Mean	0.9798
C.V.	15.39644
R-Square	0.0405
Adj R-Sq	0.0388

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.40572	0.13134225	3.089	0.002
FFSINC	1	0.900764	0.10286651	8.757	0.0001
PRICE	1	-0.322258	0.08552662	-3.768	0.0002
PRICE*DUM	1	-0.061695	0.41016224	-0.15	0.8805
DUMMY	1	0.064608	0.42401973	0.152	0.8789

Attachment 4

ALTERNATIVE ASYMMETRIC MODEL REGRESSION ON ALL SPECIALTIES

ANALYSIS OF VARIANCE

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	4.86135	1.21534	32.235	0.0001
Error	2114	79.70374	0.03770		
C Total	2118	84.56509			

Statistic	Value
Root MSE	0.19417
Dep Mean	1.01422
C.V.	19.14504
R-Square	0.0575
Adj R-Sq	0.0557

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob> T
INTERCEPT	1	0.489464	0.12997693	3.766	0.0002
FFSINC	1	0.847524	0.07993047	10.603	0.0001
PRICE*DUM1	1	-0.306631	0.10238231	-2.995	0.0028
PRICE*DUM2	1	-0.130774	0.13870402	-0.943	0.3459
DUMMY2	1	-0.181397	0.18159091	-0.999	0.3179