

An Alternative Collection Method and Its Impact on Accuracy, Reliability and Efficiency of the CPI Program:

The case of automobile insurance in Canada*

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Abstract: Statistics Canada is very much concerned with quality assurance and is constantly seeking ways to address issues associated with constructing an accurate consumer price index, not only from a methodological standpoint but also from a data sources perspective. After all, a consumer price index is only as accurate as are the underlying concepts, methods and data sources. Until recently, the measurement of price changes in the service sector, for the most part, was neglected by statistical agencies. Like most services, the nature of the insurance industry is very complex and price changes are difficult to measure. Insurance policies range from auto insurance to life insurance and can cover a variety of risks. In addition, individuals seeking insurance have a wide variety of tools that they can use to seek the lowest quote. As a result, obtaining accurate and measurable price statistics for insurance is a complex task. Specifically, this paper compares and contrasts among two price data collection processes for auto insurance, but much of the general discussion could be extended to other goods and services. The construction of a reliable price index for insurance can be difficult to achieve in practice but it is very pertinent in order to produce a reliable consumer price index, especially since the importance of insurance as a component in the basket of goods and services has been trending upwards. Compared to Statistics Canada's previous data collection process, based on rate books, we find that the new approach based on an electronic database will improve the overall efficiency of Statistics Canada's price collection process while maintaining or enhancing the accuracy of the auto insurance price index.

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1. Introduction

The Consumer Price Index (CPI) is a summary statistic that measures pure changes in the prices of consumer goods and services purchased by the typical household over a specified period of time. The CPI has become an essential statistic for monetary policy and is used in a wide variety of private and public contracts as the appropriate measure of price change for purposes of adjusting payments such as wages, rents, social security or other payments to maintain previous purchasing power in the face of changing consumer prices. The CPI is one of the most widely used statistics and plays a major importance in the daily lives of Canadians. As a result, it is necessary for Statistics Canada to perform quality assurance in the construction of the CPI. One means of ensuring quality assurance is to ascertain that the collection of prices is accurate and efficient. After all, a CPI is only as accurate as are the underlying concepts, methods and data sources. Specifically, this paper compares and contrasts among two price data collection processes for auto insurance, but much of the general discussion could be extended to other goods and services.

Services, such as insurance, are typically more difficult to price compared to goods. Prices of services are often difficult to measure because services are often heterogeneous and tend to be delivered in quite a disaggregated way.¹ In addition, quality adjustments are particularly challenging, as it is usually a complicated process to quantify the characteristics of services.² Pricing services will only become more complex as markets evolve with time. Vehicles themselves are constantly changing over time and as modifications are made to vehicles to reduce the likelihood or cost of an unwanted economic risk from occurring, the price of auto insurance will change. For instance, the market for vehicles has become increasingly diluted in recent times due to the ease of foreign competition.

The importance of the service sector in the Canadian economy has been on the rise, increasing from 64.9 per cent of total real GDP in 1981 to 69.6 per cent in 2006. Hence, services have become an increasingly important component of the basket of goods and services. As a result, the need for improved price measures for this sector has become increasingly pressing.³ As measured by the 2005 Survey of Household Spending (SHS), expenditures for auto insurance have been trending upwards over time. Between 2001 and 2005, expenditures for auto insurance increased by over 22 per cent. In addition, auto insurance weights in the basket of goods and services increased by nearly 16 per cent over the same period.⁴ Out of all insurance categories (tenants insurance, homeowners' insurance, automotive insurance and insurance of recreational vehicles),

¹ See Heath (2007).

² See Heath (2007).

³ As noted by Diewert (2004), there are generally many more goods categories than service categories if one looks at the published CPI categories. Diewert also indicates that correctly pricing insurance is a difficult task and that further work in this area is required.

⁴ Here the term "weights" refers to the aggregate dollar expenditure on auto insurance as a proportion of the overall expenditure in the basket of goods and services. That is, the term "weight" is the expenditure share of auto insurance in the basket of goods and services.

automotive insurance is by far the largest component and had the largest percentage increase in expenditures between 2001 and 2005.

Prior to the late 1990s, statistical agencies, for the most part, neglected to upgrade and expand their measurement techniques of price change in the services sector.⁵ Statistical agencies around the world, however, have made substantial progress over the last 10 years to address the need and concern for the collection of services price data.⁶ As Heath (2007) noted, in the past decade or so there appears to have been more of an interest in the measurement issues associated with the CPI and the impact that these might have on macroeconomic policy making. One reason that Heath (2007) cites for this phenomena is that the level of inflation in most countries has been moderate and thus some of the bias that results from measurement issues are proportionately larger than they used to be. In addition, Heath (2007) provides other reasons for this occurrence including globalization and increased integration across economies, which has increased the range of products that are available to consumers. A final motivation for the increased concern by statistical agencies for measurement issues noted by Heath (2007) is due in part to the significant structural changes that have occurred in the economy over the past decade or so. Examples of major structural changes that Heath (2007) provides are changes to the way in which things are sold to consumers (i.e. big box stores and the internet), the rate at which new products are introduced into the market and the rate at which products evolve.

There exists a variety of methods for collecting price data, ranging from telephone calls to surveys and from scanner data to internet price collection and databases. Each approach has their advantages and disadvantages. The underlying objective of any approach is to obtain the most amount of reliable data as possible, using the most efficient means and given the environmental and resource constraints faced by the statistical agency. As the complexity of the economy ensues it is necessary for statistical agencies to adopt new practices in order to ensure a sound CPI. Statistical agencies use a variety of data collection techniques and new collection methods are continually becoming available as technology advances. The scope for improving the efficiency of the data collection process can increase with the arrival of technological advancements in the marketplace.

There exists a wide range of conceptual approaches for measuring insurance, such as the payments, use or acquisition methods.⁷ Each approach, however, suffers from practical measurement difficulties. The emphasis of this paper is not to provide a detailed analysis of the different conceptual frameworks that can be used to measure insurance prices but rather to compare and contrast between Statistics Canada's previous collection process

⁵ See Statistics Canada (2004) for further information.

⁶ Recognizing the need for more and better information on the services sector, the Voorburg Group on Services Statistics was formed in the 1980s to facilitate the sharing of knowledge on this topic. In 1997, a Services Division was created at Statistics Canada and progress has been made in measuring price and real output in services industries. In addition, between 1998 and 2003 the Brookings Institution held several workshops on services statistics. These ventures have helped to overcome the conceptual difficulties associated with producing services price indexes. See Statistics Canada (2004) for a further discussion on the improvements made to services price indexes over time.

⁷ See International Labour Office et. al. (2004) for further information.

and a new proposed approach using an electronic database of insurance prices. We will thus take the current approach to constructing an insurance price index as given.

In the following section we provide an overview of the auto insurance industry and the methodological approach currently used by Statistics Canada to measure the price of auto insurance. In Sections 3 and 4 we provide a discussion on the previous and new price data collection processes, respectively. Section 5 provides a comparison of the auto insurance price index computed from using the two sources of data. Advantages and disadvantages of the new data collection process are discussed in Section 6 and Section 7 concludes.

2. Background

Auto insurance allows individuals to pool and shift risk that they are not willing or able to bear for themselves. Individuals can protect themselves against financial losses resulting from the economic consequence of a wide variety of perils by purchasing insurance. Like all insurance industries, the auto insurance industry is very complex and policies differ on many aspects. As a result, it is a difficult task to accurately measure price changes of insurance.

Changes in the price of auto insurance can occur as a result of two factors.⁸ The first is that auto insurance prices can change due to changes in the underlying inherent risk associated with the policy, such as an increase in the likelihood of the losses event occurring or a rise in the value of expected claims to be paid out by the insurance company in the incident that the loss event occurs. Secondly, auto insurance prices may change due to modifications in the implicit service charges, which are charged to the insured by the insurance company for administration costs (quality changes).

Statistics Canada currently uses a gross premium approach for pricing auto insurance. This method is used for the most part because of its practicality. In addition, gross premium rates for auto insurance policies are observable and are usually available in the time frame required for the computation of a CPI. The insurance policy is priced using a variety of quotes provided by insurance companies and all policies are held fixed over time; that is, all contract details and conditions including driver and vehicle classes are held constant.

The price of auto insurance is a complicated function that depends primarily on the following eight major components:⁹

1. Age
2. Gender
3. Location of residence
4. Characteristics of the vehicle (age, make and model)
5. The length of time that the driver has had his/her licence

⁸ See Beelen (2004) for further information.

⁹ See Kelly and Neilson (2006), Kelly and Neilson (2005), Bureau d'assurance du Canada (2005) and Miller, Michael J., and Richard A. Smith (2003).

6. The driving history of the driver (accidents, fines, previous claims, etc.)
7. The usage of the vehicle (for pleasure or work and amount of kilometres)
8. The type of policy (type of coverage, deductibles, liability, etc.)

As a result, the movement of auto insurance prices over time can be measured by creating weighted fixed profiles from the above factors. Statistics Canada tries to incorporate most of these characteristics in pricing auto insurance. Unfortunately, under the previous mundane process of collecting auto insurance using rate books provided by insurance companies, it was not practical to incorporate all possible combinations of the characteristics that drive insurance prices. For instance, liability coverage can range anywhere from one million dollars to upwards of five million dollars and deductibles can range from zero dollars to a thousand dollars. This is a limitation to the previous approach of data collection and will be discussed in more detail below.

Due to the limitations imposed from the previous data collection process, Statistics Canada presently uses the following characteristics to price auto insurance across a selection of insurance companies:¹⁰

1. Location of residence by province and postal code
2. Driver profile:
 - a. Age
 - b. Gender
 - c. Unknown occupation assumed
 - d. Number of years that the insured has had an insurance policy
 - e. Number of months the insured has been with the same insurance provider
 - f. Marital status
3. Vehicle make, model and year
4. A fixed insurance policy is assumed

For each auto insurance quote, the characteristics of the insurance policy remains fixed. In addition, Statistics Canada prices auto insurance on a fixed set of vehicle types, which are updated throughout the year so that the vehicles in the sample remain four years old.¹¹ The vehicles priced make up a significant proportion of the total market share of all vehicles sold. This process is consistent with the notion of a fixed basket.

3. Overview of the Previous Price Collection Approach

Prices Division compiles various price quotes for auto insurance using a model based approach relying on a number of underlying assumptions, as discussed in Section 2. In an ideal world, the aim of a statistical agency would be to collect prices for every different type of profile possible and to use such information to compute an auto insurance price index with a high degree of accuracy. This, however, is far from reality and statistical agencies must make the best use of the data that is available to them given the resource

¹⁰ A review of the current methodology is under way and a new improved approach is expected to be employed in the near future.

¹¹ In 2007, for example, auto insurance prices are collected using 2003 makes and models of vehicles.

and environmental constraints that they face. The level of resources available, therefore, puts a constraint on the sample size obtained.

As mentioned above, Statistics Canada previously collected auto insurance prices using rate books provided by insurance companies. This approach to price collection is limited as it is a timely procedure to impute price information. In addition, Statistics Canada relies on the goodwill of insurance companies to provide rate books and insurance companies are often reluctant to provide up-to-date manuals on a regular basis.

Using rate books to obtain insurance data is a very mundane process as it requires an employee of Statistics Canada to first locate the insurance quote from the rate book, a complicated task on its own, and then manually transfer this price into an excel spreadsheet. Once all insurance quotes for each policy and for every region of the country have been entered into the spreadsheet, the index is computed. Due to the labour intensive process and the limited up-to-date information, the use of the rate books for data only allows for a limited sample size and is likely to have poor representativity properties, leading to the possibility of inaccurate results.

4. Overview of the New Price Collection Approach

Taking advantage of the huge amount of electronic data is becoming an increasingly important task for statistical agencies. In June 2007, Statistics Canada employed the use of Compu-Quote, an electronic insurance database, for the provinces of Ontario and Nova Scotia.¹² The Compu-Quote insurance database provides Canada-wide price data for automobile and property insurance offered by a large number of carriers.^{13,14} The database offers auto insurance prices for all vehicle makes and models and for every type of policy available in the market. The database software includes applications that allow the user to generate price comparison reports, as well as to download large batches of pre-specified policies on a regular basis. The price comparison reports include a detailed breakdown of the prices of the various components of a policy and allow for quick and easy comparison among different policies. The batch-download application provides the capacity to obtain large price datasets in digital format, which are readily available for price index computation. In addition, the Compu-Quote database is updated on a bi-weekly basis.

Essentially, Compu-Quote acts as an intermediary between the licensee and insurance companies and the cost to purchase the database is relatively reasonable. The database is a widely used; over 30,000 insurance professionals, 2,500 consultants and 75 insurance companies use Compu-Quote on a regular basis.¹⁵

¹² Compu-Quote will serve as the source of data for the revised homeowner's insurance methodology. For a further discussion see Hume (2007).

¹³ The database does not include automobile insurance prices for Quebec, Manitoba, Saskatchewan and British Columbia due to the public provision of insurance in these provinces.

¹⁴ Compu-Quote provides auto insurance prices for more than 100 carriers by province.

¹⁵ Ezzaouali and Lequain (2007).

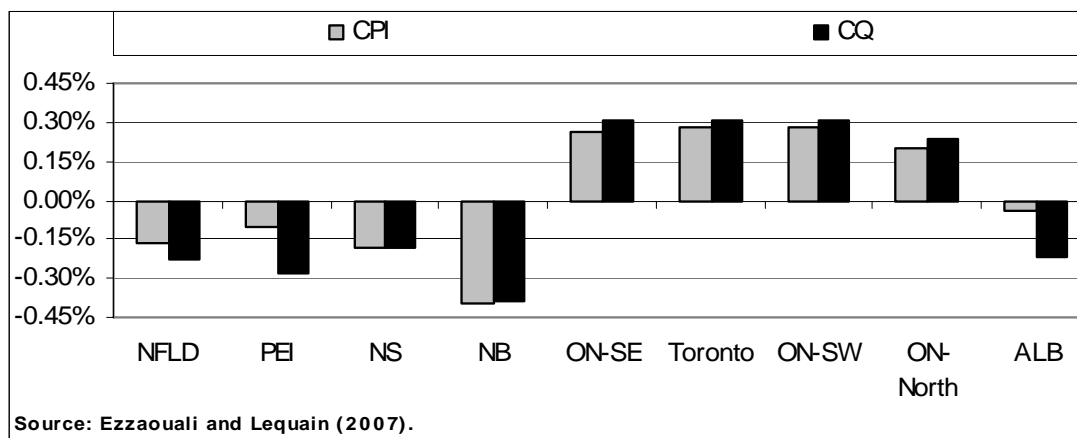
5. Comparison of the Auto Insurance Price Index between the two Data Sources

In a previous data confrontation study conducted by Statistics Canada, price movements for auto insurance using Compu-Quote were compared to those using the rate books for the period from April 2005 to February 2007.¹⁶ This analysis was conducted across all regions except for those with private auto insurance (Quebec, Manitoba, Saskatchewan and British Columbia). In order to ensure that the auto insurance quotes from Compu-Quote were comparable to the insurance prices collected using the rate books, insurance policies were fixed to those previously priced to compute the index using the rate books.

The results between the two data collection approaches are similar for only Ontario and to a lesser extent New Brunswick. For all other provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia and Alberta) there was a significant discrepancy between the two sources of data. Ontario and to a lesser extent New Brunswick are the only provinces for which Statistics Canada usually obtains regular and up-to-date rate books. Thus it should not be startling that the results between the two sources of data are the most consistent for these two provinces.

The underlying trends, however, of the price movements and the year-over-year price changes, for the most part, were similar for all of the provinces studied. (See Chart 1.) The overall results of this study should not come as a surprise. Rather, the difference in the results between the two data sources is an indication of the fact that the auto insurance price index computed using rate books failed to incorporate the most up-to-date price data due to the fact that insurance companies are often reluctant to provide Statistics Canada with updated rate books in a timely fashion, if at all.

Chart 1: Compound Monthly Growth Rate of the Auto Insurance Price Index Using Compu-Quote (CQ) and Rate Books (CPI), April 2005 to May 2007*



*Auto insurance index for April 2005=100. The monthly compounded growth rates are only calculated up until May 2007 because in June 2007 Compu-Quote was used as a source of data for Ontario and Nova Scotia.

¹⁶ See Ezzaouali and Lequain (2007) for further information.

6. Advantages and Disadvantages of the New Approach for Auto Insurance Price Collection

In this section we outline the various disadvantages and advantages between the two methods for collecting auto insurance price data.

6.1 Advantages of the New Approach for Auto Insurance Price Collection

Taking advantage of the huge amount of electronic data available is becoming an increasingly important task in the field of statistics. Using Compu-Quote will offer significant advantages for Statistics Canada. Table 1 outlines the advantages that are expected from the new data collection approach. Below we provide a detailed discussion on each of the advantages.

Overall, the advantages of the auto insurance price database are all focused around the common themes of increased quality assurance, credibility and flexibility. The first advantage is that using the Compu-Quote database will no longer require the cooperation of insurance carriers, who previously provided the rate books used for production. Since many insurance carriers are reluctant to provide updated rate books on a timely basis, the problem of obtaining reliable data will be significantly reduced. In addition, reducing the response burden placed on insurance carriers is an important consideration given the continued development of the insurance carrier price survey for the Services Producer Price Index Program. Compu-Quote is used by insurance carriers themselves and is essentially a collection of all rate books; however, it is still advised that Statistics Canada obtain rate books for verification requirements, as will be discussed below.

The second advantage offers Statistics Canada a higher degree of flexibility and will provide a significant benefit. With quick and easy access to unlimited amounts of auto insurance prices for any type of profile, Statistics Canada has the ability to evaluate their current methodology for pricing auto insurance and the possibility to develop new and improved methods. In addition, the database will allow Statistics Canada to conduct experiments on the data with ease, such as a review of the characteristics which act as the driving forces in determining the price of an auto insurance policy.¹⁷

The third advantage follows from the second and will offer a significant degree of benefit to Statistics Canada. Compu-Quote provides Statistics Canada with up-to-date auto insurance prices and the ability to increase its sample size with ease. As a result, the use of Compu-Quote data will result in a more credible and representative sample, one that covers a more diverse set of insurance carriers, regions and policy types. This benefit has the potential to reduce the bias and variability of the index and will lead to increased quality assurance in the auto insurance price index computed by Statistics Canada.

¹⁷ Using data from Compu-Quote, Ezzaouali and Lequain (2007) present a number of scenarios showing the impact that different insured characteristics and policy types have on the price of auto insurance. For example, they show that the gender of the insurer across the four age groups (25, 35, 55 and 70) has no significant impacts on the price of auto insurance, *ceteris paribus*.

The fourth advantage is that Compu-Quote will reduce person hours required to compute insurance price indexes. Using the rate books it took an employee of Statistics Canada one week to price auto insurance for *one insurance* company in Ontario, whereas using Compu-Quote it takes only two days to collect the insurance prices of *all insurance companies* in Ontario. The benefit of the fourth advantage is partially offset by the fact that a more complicated methodology could require more person hours to compute the auto insurance index using Compu-Quote. As the methodology becomes more complex it may also be necessary for Statistics Canada to put in place additional checks to verify data accuracy.

The final advantage that Compu-Quote offers is that using a database to download auto insurance quotes will reduce the probability of human error compared to the old method in which data was manually entered into a spreadsheet. This is expected to offer Statistics Canada a high degree of benefit as it will enhance the quality, accuracy and credibility of the auto insurance price index.

Table 1: Advantages of Using Compu-Quote as a Data Source

Advantages
1. Implementing the use of the Compu-Quote database will no longer require the collaboration with insurance companies to provide rate books.
2. Compu-Quote will facilitate the Prices Division to review and improve their current methodologies for measuring auto insurance prices and allow for additional experiments to be conducted.
3. The use of Compu-Quote data will result in a more credible and representative sample; one in which covers a more diversified set of insurance companies and policy types.
4. Compu-Quote will require the use of less human resources to compute the auto insurance price index.
5. Using a database instead of manually entering data into a spreadsheet will significantly lower the probability of human error.

6.2 Disadvantages of the New Approach for Auto Insurance Price Collection

In practice, there is a trade-off between cost and accuracy. Typically, the high level of accuracy that is desirable requires larger sample sizes and this is often not affordable. In such cases, costs often determine the sample size and the level of accuracy may somewhat suffer.¹⁸ Hence, there are always downsides to any price collection method. Although all minor, there are a few disadvantages of using Compu-Quote as a data source. Below we provide a detailed discussion on the disadvantages of Compu-Quote and Table 2 provides a summary of our discussion.

¹⁸ See International Monetary Fund (2003).

The first disadvantage is very minor but is one worth mentioning. Compu-Quote does not provide insurance quotes for the provinces of British Columbia, Saskatchewan, Manitoba and Quebec due to the public provision of insurance in these provinces. As a result, government rate books must be used to price auto insurance in these regions. This problem, however, exists whether Statistics Canada uses rate books provided by insurance companies or Compu-Quote.

The direct cost of Compu-Quote is roughly equal to the cost of a half person year and is thus a disadvantage considering that the rate books provided by insurance companies are free. The use of a digital database, however, allows for a much more productive computation of the auto insurance price index. This is due to a significant reduction in the need for manual intervention, while simultaneously expanding the range of policy types and regions for which prices are obtained. Thus using Compu-Quote is significantly less labour intensive compared to using rate books to price insurance. As mentioned above, actually labour hours to price auto insurance are significantly reduced using Compu-Quote. An additional consideration is the relative ease with which quality analysis can be undertaken when price data is readily accessible. Such analysis will be conducted with much more ease using Compu-Quote compared to using the rate books, as the need for manual procedures will be reduced. Taking into consideration the reduction in manual labour, the absolute cost associated with using Compu-Quote is roughly equal or perhaps even lower than the use of rate books. As a result, this disadvantage is also a low degree of concern.

The third disadvantage is also a low degree of concern to Statistics Canada. Although Compu-Quote will provide the benefit of being able to obtain and work with many more price quotes, it will also increase the degree of verification that is necessary in order to ensure that the price data quoted by Compu-Quote is accurate. Some insurance companies, for instance, refuse to sell auto insurance to specific regions of the country and will thus quote an extremely high auto insurance price in order to avoid such sales. Using such prices in the auto insurance index would bias results. As a result, it is necessary for Statistics Canada to develop additional programs, such as a detection program for outliers. In addition, new methodology practices may also increase the need for more verification controls. This, however, is not expected to require much more effort than other quality assurance procedures which were in place at Statistics Canada for computing the auto insurance index using rate books.

The final concern of using Compu-Quote is the problem of using only one supplier of information. The risk of using a single provider as the primary data source for an index is that production is dependent on being able to obtain this database on a continuing basis. This risk, however, is likely marginal if not minimal due to the widespread use of Compu-Quote in both the United States and Canada and its almost 25 years of continuous availability. Continuing to obtain rate books from insurance company will serve as a back-up in the unlikely event that Compu-Quote ceases to exist.

Table 2: Disadvantages of Using Compu-Quote as a Data Source

Disadvantage
1. The coverage of Compu-Quote is not comprehensive as it excludes auto insurance prices for provinces in which insurance is regulated by the government (Quebec, Manitoba, Saskatchewan and British Columbia).
2. The direct cost associated with using Compu-Quote is approximately equal to half a person year and is much higher than the use of rate books, which are free.
3. Using Compu-Quote will increase the degree of verification necessary to ensure that the price data quoted by the database is accurate.
4. The risk of using a single provider as the primary data source for an index is that production is dependent on being able to obtain this database on a continuing basis.

7. Conclusion

As suggested by Diewert (1999), the main changes of things to come at statistical agencies over the next two decades will likely be centred on data collection techniques. Such advancements will lead to a vast improvement in the quality and quantity of data collected. As a result, indexes based on such information will become more credible and accurate. It is important that Statistics Canada move towards the adoption of new technologies and procedures around the data collection process. Markets for goods and services are becoming increasingly more complex with time and the data collection process will only follow suit. It is of great importance that statistical agencies, like Statistics Canada, take action and move with the times or else face an uncertain future and diminished role in the field of data collection.

It is the utmost concern that Statistics Canada remains a provider of credible and high quality products and it is thus a major concern for the Prices Division that we are making use of the most efficient technologies available for price collection. With out-a-doubt, the new system has its minor disadvantages, but the advantages totally outweigh these concerns. Statistics Canada recognizes that the information obtained from these new data sources will have to be monitored for possible discrepancies and regularly matched against other sources of information. This, however, will not require much more effort than other quality assurance procedures that Statistics Canada already has in place for other price collection methods. In light of the decreased costs over time, the increased credibility of the auto price insurance index and the increased flexibility, such as the possibility for further methodological advancement in pricing the services of this complex market, we conclude that Compu-Quote is a worthwhile investment and is one that will improve the overall efficiency of the price collection process while maintaining or enhancing the accuracy of the auto insurance price index.

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