Output of the property and casualty insurance industry

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1. Preface

This paper presents two concepts of output for the property and casualty insurance industry. One is implicit in the U.S. national accounts and the 1993 System of National Accounts (SNA); the other is from the economics literature.

For each concept, alternative methods for measuring the nominal value of insurance output are presented. A comparison is made of methods for converting the nominal value of output into real output. Finally, the paper examines whether the use of the national accounts concept in published aggregate productivity measures leads to an understatement of productivity growth.

2. Introduction

Considerable discussion has taken place among experts in national income accounting regarding the measurement of the output and activities of the insurance industry. Typically, this discussion has focused upon the collection of information needed to represent the industry's complex financial and institutional characteristics. Difficulties in measuring real output have also been noted.[1]

This paper will proceed as follows. The concepts of output from the literature and from the national accounts will be compared. Alternative methods for measuring the nominal value of both concepts will follow. A general discussion of factors leading to changes in real output will precede discussion of alternative methods for measuring real output.

The impact on output and productivity measures that would result from adopting the alternative concept from the economics literature will then be analyzed. Finally, the issue of uncertainty and the need to account for it in an output measure will be presented. An appendix deals with further issues that would arise in trying to construct a measure of the sort recommended.

It will be argued that a measure of the insurance industry's output should be based upon the concept of output set forth in the economics literature. However, within an aggregate framework, such as Gross Domestic Product (GDP) or the

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Bureau of Labor Statistics (BLS) non-farm business sector productivity, this choice is shown to have minimal impact on the aggregate output measurements.

3. Background

Before proceeding, the *concept* of output needs to be distinguished from the *measure* of output. For example, one concept of output is the assumption of risk by the industry. One measure of this output concept is premiums.

To correctly define the output of a service industry it is essential to specify exactly what the industry agrees to sell and what the customer agrees to buy. That is, a determination must be made of what is implicitly 'contracted for' when a transaction takes place. Further, it is important to distinguish between the *output* produced and the *activities* carried out to produce the output.

The transaction that takes place between the insurance industry and a policyholder is recorded in an insurance contract. In the transaction the industry agrees to assume a certain amount of the policyholder's risk and the policyholder pays the industry to assume that amount of risk. In a simple model, the policyholder pays a premium for this service.

The *amount of risk* (or quantity) assumed is the probability of a loss times the amount of insurance carried to cover the loss. Thus, the amount of risk covered by a contract will be affected by both the probability of an unfortunate event and the amount of settlement that would be paid if the event were to occur. The aggregate quantity of risk assumed by the industry will equal the aggregation of the amount of risk assumed for all policy holders.

To illustrate, suppose each of 1,000 policy holders owns a $200,000 house. From past experience it is known that one house will be destroyed by fire during the policy period.

The probability of loss is 1/1000 = .001. The amount of risk in each policy is $200 = (.001 x $200,000).

The aggregate amount of risk transferred to the industry is $200,000 (1,000 x $200). Premiums would be $200 (plus some amount for administrative expenses) per policy, and the resulting pool of money would equal the $200,000 needed to replace one house.

Two observations can be made here. First, this example is oversimplified because in reality there is uncertainty with respect to the probability of a loss. In some years, more than one house might be lost and in other years no houses would be lost. However, the function of insurance is to combine a large number of risks and, by so doing, reduce the *degree of uncertainty* surrounding the probability of an unfortunate event.

Second, the risk that the company assumes is ex ante. Ex post there is no risk. Even if no unfortunate event occurred during the year and the industry paid no claims, it would still have provided the service of risk assumption.

4. Two concepts

The premiums collected by the industry are used to pay claims and to cover administrative costs (which throughout this paper include profits). Because of the intermediary nature of the payment of claims, premiums will exceed the industry's costs of labour, capital, and intermediate purchases of materials, energy, and services.

A concept of output evolves from the convention used in the national accounts. The convention is that the value of output of the insurance industry is equal to premiums less claims, sometimes referred to as net premiums.[2]

In a simple model in which premiums equal claims plus administrative costs, the implication of the national accounts convention is that the nominal value of output of the industry is equal to the administrative costs of providing insurance. The administrative costs are due to activities such as selling policies, performing actuarial work, and settling claims.

A concept of output consistent with the premiums less claims measure can be found in the literature. As the basis of a real output measure constructed for the life insurance industry, Hirshhorn and Geehan argue as follows: "A life insurance company is able to offer protection because it has created the facilities for pooling risks; and it is the range of activities a life insurance company undertakes as part of its efforts to maintain its capacity for pooling risks that constitutes the services provided by the company" (1980, 152). The basis of their output measure includes the costs of selling policies and assembling and administering a pool of insurance funds (i.e., administrative costs).

Thus, the net premiums notion is consistent with a concept of output that is *the activities carried out by the industry to maintain the capacity for pooling risks*. Let us refer to this as Concept 1.

Although part of the policyholders' premiums pay the expenses the industry incurs in performing these activities, it can be argued that the actual output is the quantity of risk transferred to the industry. That is, the policy holders and the industry contract for an amount of risk coverage; not for the performance of certain activities. This argument leads to an alternative concept of output proposed in the economics literature.

Denny (1980, 151) argued that the output of the insurance industry is the quantity of risk shifted to the industry by those who purchase insurance. Businesses and households protect themselves from risk by transferring it to the insurance industry in exchange for premium payments.

The concept of quantity of risk was suggested by Denny in the context of a simple illustration (not as a complete proposal) in which administrative costs were assumed away. To extend the notion, the industry's administrative activities must take place in order for the industry to assume the risk. The concept is then defined as the *assumption of a certain quantity of risk*, or *assumption of risk* for short. This distinction between the quantity of risk and the actual assumption of

that quantity of risk is non-trivial and is useful in measuring real output. Let us refer to *the assumption of risk* as Concept 2.

Ruggles (1983, 67-69) also implicitly chose Concept 2 by suggesting the use of premiums as the measure of output. Premiums provide a realistic description of the transactions carried out by households and other businesses who pay the insurance industry for protection against loss. These premiums are used to pay claims for losses and to cover the costs and profits of the insurance industry.

For the purpose of describing the relationship of the insurance industry to other sectors of the economy, the output concept of assumption of risk still requires a reconciliation of premium receipts with the costs of inputs. In a paper on the fire and casualty insurance industry, Hornstein and Prescott (H&P) (1991a) provide a justification for treating the product of the insurance industry like any other commodity. H&P present a simple economy in which there are three production sectors -- the property and casualty insurance sector, the capital goods producing sector, and a sector producing all other goods and services. The insurance industry transacts with customers who buy its policies and with the capital goods producing industry that produces the replacement goods. When accidents occur during the period, the insurance industry pays claimants with the replacement capital goods.

The insurance industry can be viewed as purchasing the replacement capital goods from the capital goods producing industry and then passing the goods through to claimants. Consequently, the replacement capital goods are intermediate inputs for the insurance industry. The costs of the activities carried out to maintain the pool represent the value added.

The advantage of the concept of risk assumption versus the concept implicit in the national accounts convention is that it permits a more meaningful description of the service the insurance industry provides to customers. Also, the insurance production process is treated in a way analogous to the production process in the goods sector.

First, customers purchase a product which represents the risk protection they purchase. The premium is the price paid for the protection. The industry's receipts also reflect this. This concept addresses Walton's (1993, 206) and Ruggles' (1983, 67-69) observations that consumers actually view insurance output and their transactions with the insurance industry differently than is implied in a formulation in which output is equal to premiums less claims.

Second, the industry produces a product and is able to market it and command a price just as other industries do in the market place. With the H&P interpretation of claims as intermediate purchases, we can describe a production process for the industry analogous to that for an industry in the manufacturing sector. The industry buys primary inputs, capital and labour, plus intermediate purchases (replacement capital goods) and produces a product. Consequently, the premiums collected by the industry equal the costs of the factors of production.

Before proceeding, it should be noted that Diewert (1995) used utility theory in order to define the output of the industry. He defined output as the improvement in utility due to the availability of insurance -- the increase in utility measured as the difference between the post- and pre-insurance utility levels. He developed a framework in which utility measures could be estimated econometrically with data on the real value of insurance coverage, the real value of insurable property, and the probability of loss.

Diewert suggested a measure of the nominal value of output based upon premiums that is consistent with the measure put forth by Denny, Ruggles, and H&P. But his method allowed for an estimation of real output without requiring a deflator for premiums. This will be discussed later in this paper.

5. Measuring the nominal value of output

The starting point for a measure of the nominal value of output is the value of the amount of risk assumed by the company plus the administrative costs of assuming the risk. In the simple model discussed prior to this point, the amount of risk, which is an ex ante notion, equals the claims, which is an ex post notion. Because there is some degree of uncertainty attached to the probability of loss, these two notions in fact need not be equal.

The nominal measure should reflect the ex ante notion. To accomplish this, it is possible to add up the money the industry has available to assume risk (to pay claims) and to cover administrative costs. This will be the starting point for measuring either Concept 1 or Concept 2.

A measure of the nominal value of output based upon either the national accounts implicit Concept 1 or the alternative Concept 2 of assumption of risk begins with a measure of premiums. In addition to premiums the industry has another important source of funds.

5.1 Investment earnings on premiums

The industry invests premiums. In the insurance industry this investment activity is sometimes referred to in terms of investing reserves. Reserves represent debts to policyholders and are the major liabilities of the industry. For instance, unearned premium reserves represent the premiums that have been paid in advance for the unexpired term of the policies.

Investing premiums or reserves is one of the activities that the industry carries out to construct and maintain a pool of funds in order to assume risk. Although this investment function of the insurance industry should be viewed as an activity and not a service, the following quotations from a publication of a large insurance company describe the importance of the industry's practice of carrying reserves and earning interest:

> "Insurance provides an additional service benefitting business and consumers alike. That is performed by U.S. insurers as suppliers of financial capital to the economy,

> through investment of a substantial portion of their assets, which totaled approximately $900 billion at the end of 1983."
>
> "Of this amount, some $655 billion were life insurance companies' assets, while property and casualty companies' assets totaled some $249 billion. These combined assets, largely made up of financial investments such as stocks and bonds (and mortgages in the case of life insurers), are used to back up reserves required to be set up by insurers to meet all liabilities or policy obligations as they mature. The assets primarily represent funds created by premiums usually collected at the beginning of the policy period, for the insurer to pay claims when they develop, and to invest productively and wisely in the meantime. Another source of assets is the profits of prior years that are retained by the companies and plowed back into the business." (p. 30)
>
> "The company's investment-generated income is extremely important. In the property/casualty industry, investment income has been the only source of net operating income in the years of underwriting loss." (p. 37)

An underwriting profit or loss is the profit or loss experienced by an insurance company after deducting the incurred losses (occurrences that are the basis for submission and/or payment of claims) and expenses of doing business from premiums earned, but before provision of federal income tax. It does not include investment income.

The role of investment earnings is acknowledged in the 1993 System of National Accounts (SNA):

> "Premiums are usually paid regularly, often at the start of an insurance period, whereas claims fall due later, in the case of life insurance many years later. In the time between the payment of premiums being made and the claim being receivable, the sum involved is at the disposal of the insurance corporation to invest and earn income from it. The income thus earned allows the insurance corporations to charge lower premiums than would be the case otherwise. An adequate measure of the service provided must take account of the size of this income as well as the relative size of premiums and claims." (p. 572)

Viewed alternatively, for a given amount of premiums, the investment earnings of the industry make possible the assumption of more risk. The amount of risk assumed plus administrative costs can be as large as the sum of premiums plus interest earnings.

Thus, as compensation for allowing the industry to retain investment earnings on premiums while it is waiting to pay claims, policyholders receive an increase in the aggregate amount of risk transferred to the industry. Implicitly, policyholders and the industry 'contract for' the additional risk assumption when the industry retains interest earnings from the policyholders' premiums.[3]

A final rationale for including interest follows from Diewert's (1995, 138) reference to an actuarially fair price. In the simple case of no administrative costs and no investment earnings, he noted that the premium rate should be set such

that this rate times the amount of insurance coverage equals the probability of an unfortunate event times the amount of coverage. If we were to extend this case and apply also a rate of administrative expenses to the insurance coverage, the observed premium rate charged by the industry would not equate to the probability of loss rate plus the expense rate. (The observed premium rate might not even equate to the probability of loss rate.) As noted earlier, the industry frequently suffers underwriting losses where premiums are not sufficient to pay claims and administrative costs. Thus, there is a need to include in the nominal value of output a return associated with investing the premiums.

5.2 Four measures of nominal value

There currently exist at least two measures of the nominal value of output consistent with Concept 1. The first is the measure of output used by the U.S. Bureau of Economic Analysis (BEA). The second is the SNA measure. Both the BEA and the SNA net out claims from the output measure, that is,

$$Q^1 = P - C \text{ and } Q^2 = P(1 + i) - C$$

where:

Q^1 = nominal value of output (BEA), Q^2 = nominal value of output (SNA), P = premiums, C = claims and i = rate of return.

Corresponding to these two measures of Concept 1 are the following two measures of Concept 2:

$$Q^3 = P \text{ and } Q^4 = P(1 + i).$$

Measure Q^3 corresponds to the concept of output advocated in the economics literature by Denny, Ruggles and H&P. In specifying this measure, these authors were focused solely on overturning the convention of netting claims out of the output as is done in measure Q^1 and instead adopting a measure consistent with Concept 2.[4] Measure Q^4 goes beyond Q^2 in including investment earnings in a measure consistent with Concept 2.

It should be noted that national income accountants frequently refer to measures Q^1 and Q^2 as gross output measures. However, if we accept H&P's characterization of claims as intermediate purchases and ignore traditional intermediate purchases of items like paper and utilities, then Q^1 and Q^2 are value added notions. Measures Q^3 and Q^4 are the corresponding gross output measures. Hereafter, all four measures will be referred to simply as output measures.

6. Constructing a real measure of output

The discussion in this section will focus on methods for converting measure Q^4 into real terms. If one were to choose Q^3 instead, much but not all of the discussion is still relevant.

Before proceeding, BEA's method for converting Q^1 into real terms can be noted. There are two ways BEA measures the real output of insurance in the personal consumption component (PCE) within GDP. For automobile insurance, the base period nominal value of premiums minus claims is extrapolated with a measure of deflated premiums. The deflator is the CPI for auto insurance. Household insurance is estimated by separately deflating nominal premiums and claims. Premiums are deflated with the CPI for tenants' insurance and claims are deflated with the CPI for house furnishings.

Returning to measure Q^4, the real output of the industry changes when either of the following lead to a change in the nominal value of the industry's output: (1) a change in the probability of an unfortunate occurrence for which insurance is carried, or (2) a change in real terms in the amount of claim that would be paid if an unfortunate event were to occur.

For example, suppose the industry raises its premiums in order to account for an increase in theft and vandalism. This action would increase the value of output and the increase would be a real change because more risk is being transferred to the industry.

Following are some examples of these occurrences for the auto insurance industry for each of the two categories of change:

1) change in probability of an unfortunate occurrence
   - change in geographic location (e.g., moving a car from a suburban to an urban area)
   - change in the characteristics of the owner (e.g., a young male gets married or passes his 25th birthday)
   - change in rates of vandalism and theft
   - change in characteristics of the assets (e.g., same model of car equipped with higher horsepower engine)
2) change in amounts of loss being covered in real terms
   - change in coverage due to such things as larger jury settlements in real terms or the increase in value of higher quality cars being insured
   - change in the deductible amount, which is equivalent to a change in amount of risk transferred to the industry

An increase in the value of the insurance industry's output due to changes in the prices of its inputs represents a change in price not in output.[5] These inputs include the intermediate purchases of goods and services for settling claims. The following are some specific examples of changes in the prices of inputs:

- change in medical costs

change in prices for cars of a constant quality
change in repair costs
change in prices for utilities, paper, etc.
change in legal fees (these are fees for a purchased business service for the industry)
change in wages of insurance industry employees

In order to separate real output changes from price changes, there are two general procedures that can be followed. One is to deflate the nominal value with a price index for the product. This procedure would attempt to deflate premiums plus investment earnings. A closely related procedure is to count different types of products (e.g., contracts or policies) in the current period and apply base period prices to weight them together.

A second procedure avoids the need to deflate premiums and investment earnings directly. This is done by extrapolating the base period nominal value of output with another series representing the growth of real output. For example, the real value of the goods and services used to settle claims can be used as an extrapolater. What follows is a comparison of the merits of the two general approaches.

6.1 Deflate the nominal value with an output price index

This general approach is limited at the current time because of the lack of proper price indexes. Available price indexes are based upon premiums only.

The major limitation of using these price indexes based upon premiums is that premiums do not equal output, Q^4. To see why this matters, consider the following.

Suppose that between two time periods all risk factors are unchanged so that the amount of risk covered remains constant. Also, interest rates have declined and, in response to this decline, the industry raises premiums in order to maintain the pool of funds. Now suppose a premiums-based price index exists and that the index is adjusted for change in risk. That is, if the premium rises because the insurance industry assumes more risk, the index is adjusted so that its value remains unchanged. However, if the increased premium is not accompanied by increased risk, the index is allowed to increase. (Actually making such adjustments to a price index would be quite difficult.)

For the example given, the increased premium would lead to an increase in the premiums-based price index. If the price index were applied to the constant level of funds, it would imply a decline in real output. However, no decline in output actually occurred because the industry still assumed the same amount of risk.

The underlying weakness in a premiums-based price index is that policyholders receive services for the interest the industry retains from investing premiums. The premium does not represent the total price of the insurance coverage in a contract. For a given level of coverage, the amount of the premium

will vary depending upon interest earnings.

A closely related procedure is to weight together policies in the current period with base period prices. For example, H&P propose to measure real output by weighting the number of contracts of different types in the current period with base period prices.[6] They suggest that a base period premium for a specified policy with a particular claims distribution could be estimated with a regression equation which includes the number of claims and the value of claims as explanatory variables. The suggested procedure is designed to hold risk constant between the two periods.

H&P emphasize that they are presenting an exploratory analysis. They acknowledge also that they are neglecting interest earned by the company. However, their exploratory work can be used to illustrate further the need to account for investment earnings when measuring real output.

Premiums estimated with such a method would account for changes in risk between the two periods. However, the real value of the assumption of risk can be greater than the premiums because of the interest earnings. Even the base period premiums times the number of polices in the base period would not yield the correct level of output.

In the United States, a price index will soon be available which incorporates the investment earnings. The U.S. Bureau of Labor Statistics is now constructing a producer price index (PPI) for the property and casualty insurance industry.

This new PPI will be based upon the concept that the service is the assumption of risk. A price quotation collected for the index will include the actual policy premium for the period. In addition, it will include the investment income expected to be earned on that premium during the policy period.

6.2 Extrapolate base period nominal value of output

The output of the industry is the *assumption* of a certain quantity of risk. Think in terms of the quantity of risk, which already exists, being combined with the activities the industry performs in order to allow the company to assume that risk.

Suppose we assume that the service of assuming the amount of risk grows at the same rate as the amount of risk being transferred to the industry. That is, the service of assuming the risk is proportional to the amount of risk. Then the rate of growth of real output is equal to the real rate of growth in the amount of risk.

Equating the rates of growth of the real amount of risk and the assumption of that amount of risk implies that the important dimension of output is the amount of risk being transferred to the industry. To illustrate, if the amount of real risk remains constant between two periods even as administrative costs increase, this method assumes that the real output of the industry has not changed.

This assumption is analogous to one that could be made for certain manufacturing industries. For example, the product produced in the auto assembly industry is a car; let us assume only one homogeneous model is

produced. The nominal cost of producing this product is equal to the cost of intermediate purchases of fenders, tires, and other components plus the costs of the assembly industry's labour and capital. This nominal cost is the price the industry charges and a consumer is willing to pay for a car.

The real output of the assembly industry may be measured as the deflated value of output or as the number of cars produced. The output of the industry does not equal the parts used because it is necessary to include the industry's activities in order to transform the intermediate parts into an auto.

However, because of a fixed technical relationship between certain component parts and cars, output growth can be measured as the growth of certain parts used in the production process by the assembly industry. One example is counting steering wheels. The rate of growth in output between two years would equal the rate of growth in steering wheels used in production.

For the insurance industry, this type of relationship is useful because it is possible to derive changes in real output by examining changes in the real intermediate purchases of goods and services which would be used to pay claims. That is, the rate of growth of output can be measured by the rate of growth in intermediate purchases.

Using such a relationship, the base period nominal value of output would be extrapolated by the real risk covered. The extrapolater would equal the deflated value of funds available to cover risk.

The funds available to cover risk are the nominal value of output less administrative costs. The deflator would be constructed as weighted price indexes for replacement capital goods, repair services, medical services, and replacement of purchasing power in real terms (e.g., the all items CPI). Weights could be generated with historical data on the relative importance of settlements for each of these various types of occurrences.

Because the extrapolater is the real value of assets and services available to settle claims (or to assume risk), this procedure captures changes in real output due to changes in the probability of loss and changes in the real value of the goods and services used to settle claims. The value is determined by the industry so that it is sufficient to compensate policyholders for expected losses. The trade off between investment earnings and premiums is also captured because the nominal value is made up of funds from both of these sources.

As noted earlier, Diewert (1995) presents a methodology for deriving real output as the increase in utility due to the availability of insurance. He models a utility function which can be estimated with data on real values of the assets being insured and the probability of loss. He then derives the difference in utility measured in real property units.

His procedure differs from those presented so far in that it measures output within a utility framework rather than an accounting framework. It is similar to the method just described in that it avoids the need for a price index to apply to the nominal measure Q^4.

7. Implications of employing Concept 2

A concept of insurance output is needed for constructing an output measure for the industry. As discussed earlier, national income accountants refer to an output measure consistent with Concept 1 as gross output. However, within the economics literature, Concept 1 is actually consistent with a value added measure if we abstract from intermediate purchases of items like paper and utilities. Concept 2 is consistent with a gross output measure.

If a gross output measure of industry output is desired, then Concept 2 should be employed. Further, although not an issue of concept choice, investment earnings on premiums should be included in output. The difference in growth rates between insurance industry output measures derived according to Concept 1 and Concept 2 will not be discussed here.

A concept of insurance is also needed for measuring the output and productivity of aggregate sectors of the economy that include the insurance industry. Following is a discussion of the implication of employing Concept 2 rather than Concept 1 as the basis for measuring property and casualty insurance output within the BLS non-farm business sector.

Non-farm business sector productivity is the featured BLS productivity measure. This series, which is followed with great interest by the public, is sometimes alleged to understate productivity growth because of difficulties in measuring service sector output. Critics contend that the growth rates of many service industry outputs are understated.

Recalculating non-farm business output with insurance measured according to Concept 2 allows for an assessment of whether the use of Concept 1 by national income accountants results in an understatement of output and productivity growth. Data for the period 1987 to 1996 are presented to illustrate the possible magnitude of such an understatement.

Two other differences between the national accounts measure and the alternative measure presented in this paper will be considered. Adding investment income to insurance output differs from current BEA procedures. Also, an alternative measure will involve a different deflation procedure.

It will be shown that necessary offsetting adjustments to other industries' outputs will result in an unchanged situation when moving from the premiums minus claims to the premiums measure. Second, adding investment income will have a negligible impact on the aggregate measure. Finally, a different deflation procedure is unlikely to lead to dissimilar results. The concept used by national income accountants to measure property and casualty insurance does not appear to contribute to an understatement of aggregate output growth.

These findings should be viewed as tentative. In particular, more information on prices for the insurance industry's outputs and inputs are necessary to quantify accurately the impact.

7.1 Property and Casualty Insurance in GDP[7]

Output in the BLS non-farm business productivity measure is derived from GDP measured as the sum of expenditure components. This side of the national accounts measures GDP as the sum of personal consumption expenditures (PCE), gross private domestic investment, net exports, and government consumption expenditures and gross investment. The insurance transactions that take place involve the insurance industry, business, government, households, and the net export sector.

Expenditures on insurance are not specifically identified or deflated within federal government purchases. Only a small amount of insurance is included in state and local government purchases of goods and services other than compensation of employees (.223 per cent of total purchases in 1982[8]). The various governments' purchases of insurance will be ignored here.

Insurance is included in both exports of private services and in imports of private services -- no breakout for property and casualty insurance is available. For both imports and exports, insurance is measured as premiums less claims.

In the net export sector of GDP, imports are subtracted from exports. The importation of insurance is larger than the exportation of insurance -- $4.4 billions versus $2.1 billions in 1996.[9] Moving to an alternative concept, which leads to an increase in both imports and exports, is not likely to result in an increase in non-farm business productivity over time. Therefore, insurance in the net export sector will not be discussed.

Within PCE, expenditures on property and casualty insurance are present in two places. Expenditures are included for motor vehicle insurance and for fire and theft insurance on personal property.[10] (Privately administered workers' compensation is included within medical insurance in PCE and will not be discussed here.)

The following examination of the impact on productivity of an alternative methodology is limited to private automobile insurance and household insurance purchased within PCE. Private auto insurance and homeowner multiple peril insurance account for about half of property and casualty insurance premiums earned by the industry in 1996.[11]

The remaining premiums earned by the industry represent insurance sold to businesses and consequently are intermediate transactions. Intermediate transactions are not directly measured or reflected in GDP.

7.2 The current procedure

According to Concept 1, households purchase property and casualty insurance and this purchase is recorded within PCE as premiums less claims and other benefits. Household purchases made with the claims proceeds are reflected in PCE as household purchases from other businesses.

For example, in the case of auto insurance, claims for damage to autos are

reflected in household purchases from the auto repair industry. These purchases of auto repair services are included in PCE.

Thus, households pay for insurance as premiums minus claims and pay for repairs with the claims. When all expenditures are aggregated together in the derivation of GDP, the expenditures on insurance and the expenditures on repairs paid for with claims proceeds sum up to premiums.

Table 1 contains the nominal amounts of insurance contained in BLS non-farm business sector product.

TABLE 1
Premiums and claims for auto and household insurance in the non-farm business sector (billions of dollars)

	1987	1990		1996
Non-farm business sector product	3559.276	4323.225		5780.654
Automobile premiums	NA	77.3		105.3
Automobile claims	NA	59.3		74.4
Premiums less claims		18.0		30.9
Household premiums	7.54	8.23	10.75	
Household claims	4.26	5.54	8.05	
Premiums less claims	3.29	2.69	2.70	

SOURCE: Non-farm business sector product -- Bureau of Labor Statistics, Office of Productivity and Technology. Premiums and claims data -- unpublished tabulations from Bureau of Economic Analysis.

7.3 The alternative procedure

If an alternative procedure based upon Concept 2 were employed, there would be changes in the measurement procedures for output. The changes would affect the level of the nominal value of the sector's product and real output.

Nominal insurance expenditures by households derived according to Concept 2 would not be net of claims. Expenditures on insurance would equal premiums plus investment income.

Including investment income is similar to the treatment in PCE of services furnished by financial intermediaries. An imputation is made for the value of services furnished by the institutions for which no explicit payment is received. Households implicitly pay for the services when the institutions earn interest on the households' deposits.

Household purchases from other businesses made with claims proceeds would not be explicitly recorded in GDP. According to Concept 2, these expenditures represent intermediate purchases made by the insurance industry. Intermediate purchases are not included in GDP. For example, no expenditures for auto repairs paid for with claims proceeds would be included in PCE.

In the derivation of GDP according to Concept 2, an aggregation of household expenditures for insurance and household expenditures paid for with claims

would equal premiums plus investment earnings. Consequently, the alternative procedure yields a higher level of nominal GDP than the current BEA method because of the investment earnings.

It is worth emphasizing that within GDP a netting of claims is required under either the current or the alternative procedure. When implicitly making adjustments to published GDP by employing the alternative procedure, claims are added back into expenditures on insurance. However, expenditures on other businesses' goods and services paid for with these claims are removed. Adjusted GDP and BLS non-farm business sector product are not affected by this alternative netting out procedure.[12]

The following table provides some data to assess the impact of investment earnings on the level of product for the BLS non-farm business sector. The second column contains an estimate of the total value of investment gains and other earnings for private auto and for homeowner insurance.[13] Because the estimation in column 2 is derived partially from data for homeowner multiple peril insurance, which is higher than the BEA fire and theft estimate, the estimate in column 2 is an overestimate.

The impact of adding the investment earnings to nominal non-farm business output is quite small and constant over the period. The annual average growth rates between 1987 and 1996 are the same for adjusted and unadjusted product.

The alternative method would impact on the *real value* of output because of a different deflation procedure from that used by BEA. Although the following discussion examines the possible impact from moving to another deflation procedure, it is not meant to be a criticism of current BEA procedures. Current BEA procedures are frequently dictated by the availability of suitable price data.

For auto insurance, the current procedure extrapolates base period premiums minus claims with premiums deflated with the CPI for auto insurance.[14] Thus, nominal premiums and claims are assumed implicitly to be growing at the same rate. Because the estimation of nominal claims is not a function of the choice between Concepts 1 and 2, this assumption will not be discussed here.

The current method implicitly deflates claims and premiums with the same deflator. The alternative method would deflate premiums plus investment earnings but not claims.

TABLE 2
Non-farm business sector product and investment gains of private auto and homeowners multiple peril insurance (billions of dollars)

	BLS Non-farm Business Product	Investment Gain on Funds and Other Income	Adjusted Non-farm Business Product Col. 1 + Col. 2	Ratio of Adjusted to Unadjusted Non-farm Business Product Col. 3/Col. 1
1987	3559.276	4.794	3564.070	1.0013
1988	3831.546	5.350	3836.896	1.0014
1989	4120.109	5.970	4126.079	1.0014
1990	4323.225	6.455	4329.680	1.0015
1991	4420.524	6.923	4427.447	1.0016
1992	4664.103	7.459	4671.562	1.0016
1993	4923.343	7.300	4930.643	1.0015
1994	5234.987	6.676	5241.663	1.0013
1995	5492.835	7.730	5500.565	1.0014
1996	5780.654	7.670	5788.324	1.0013
Annual Growth Rate 1987-96 (compound)	5.536%		5.536%	

SOURCES: Column 1 — series from Bureau of Labor Statistics, Office of Productivity and Technology. Column 2 — derived from data from A.M. Best Company Inc. with permission. (See Appendix A.)

Two options were presented for the alternative method. Premiums plus investment earnings could be deflated with a premiums price index containing an investment component. Or, base period premiums plus investment earnings could be extrapolated with the real value of the intermediate inputs used by the insurance industry to settle claims.

For household insurance, the current procedure deflates premiums with the CPI for tenants' insurance[15] and deflates claims with the CPI for house furnishings. In the alternative method, real output would be estimated the same way as auto insurance.

Table 3 contains some alternative price indexes for the period 1987 to 1996. The claims cost indexes, which are from an insurance industry source, are price indexes derived by weighting together the price indexes (or proxy price indexes) for the various goods and services used to settle claims.[16]

These claims cost indexes are not being proposed as alternative deflators. However, they provide some additional data with which to assess the current BEA deflation procedure as well as examine the sensitivity of BLS non-farm business output to the use of alternative insurance deflation procedures.

Between 1987 and 1996, the auto claims cost index and the CPI for auto

insurance grew at fairly similar rates. This indicates that the alternative deflation procedure would likely have little impact on the growth of auto insurance between 1987 and 1996.

First, the similarity implies that the implicit deflation by BEA of claims with the CPI for auto insurance is likely equal to the deflated expenditures purchased with the claims proceeds. When the alternative procedure is used to adjust published GDP by 'leaving' the deflated claims in insurance expenditures and removing expenditures paid for with the claims, the result should be similar.

TABLE 3
Claims cost indexes and CPIs (1982-84 = 100)

	Claims Cost Auto	Auto Insurance CPI	Claims Cost Homeowner	Tenants' Insurance CPI	House-furnishing CPI	All Items CPI
1987	121.1	146.2	116.7	120.4	103.6	113.6
1988	129.4	156.6	124.8	124.9	105.1	118.3
1989	139.8	166.6	134.7	128.3	105.5	124.0
1990	147.1	177.9	140.3	130.6	106.7	130.7
1991	156.2	191.5	145.7	133.2	107.5	136.2
1992	164.3	205.5	150.9	136.5	109.0	140.3
1993	176.4	216.7	156.2	140.8	109.5	144.5
1994	184.3	224.8	161.1	145.8	111.0	148.2
1995	190.7	234.3	167.9	150.9	111.2	152.4
1996	198.5*	243.9	175.1*	154.7	111.3	156.9
Annual Growth Rate 1987-96 (compound)	5.6%	5.9%	4.6%	2.8%	0.8%	3.7%

* Estimated.

SOURCE: Columns 1 and 3 — A.M. Best Company (April 21, 1997, P/C 1 and PC 2); reproduced with permission. Columns 2, 4, 5 and 6 — Bureau of Labor Statistics, Office of Prices and Living Conditions.

Second, the premiums plus investment earnings would likely be deflated in the alternative procedure with a somewhat similar price index to the CPI currently being used by BEA to deflate premiums. That is, the CPI for auto insurance seems consistent with the growth in the prices of inputs used to settle claims.[17] The price of the inputs would be expected to be a large contributor to the growth of any premiums-type price index.

Regarding the deflation of household insurance, there is a considerable difference between the CPI for tenants' insurance and the CPI for house furnishings. This implies that the price of insurance output is rising much faster than the prices of the major inputs needed to produce that output. This can be

interpreted as due to a decline in productivity.

On the surface, this seems like an implausible productivity decline for the industry. The result could be partially due to a measurement problem. For example, premiums could be rising due to an increase in the probability of loss (e.g., increased occurrences of severe weather) and the tenants' price index is not properly adjusted for this. A difference in growth between input prices and output price would result.

Let us assume that the CPI for tenants' insurance is the more appropriate of the two deflators; that is, a claims deflator showing greater price increase is needed. Then the house furnishings CPI leads to an overstatement of claims in 1996. But because claims are subtracted in the derivation of GDP, this part of the current procedure actually understates real output growth.

A simple assessment of the impact can be made by also deflating claims with the tenants' insurance price index. As the results in column 4 in Table 4 illustrate, there is no impact. (The alternative column may be thought of also as resulting from deflating insurance premiums and then removing expenditures paid for with claims from the remainder of PCE.)

The alternative does show less of a decrease in real household expenditures over the 9 years. But in general these are very small numbers relative to the BLS non-farm business sector. They have no effect on real output growth.

Some assessment of the sensitivity of output growth to the choice of deflators may be examined by using the homeowners insurance claims cost index as a deflator. There is a considerable difference between the CPI for tenants' insurance and the claims cost index for homeowner insurance.[18] The results are not shown but again there is no impact on aggregate real output growth.

In summary, the impact on BLS non-farm business real output and productivity from moving to an insurance measure based upon Concept 2 is likely small. This tentative finding may be outlined as follows:

The effect of not subtracting claims from premiums combined with the effect of removing expenditures paid for with claims proceeds is of little consequence in terms of the impact on non-farm business product.

7.4 Industry contribution to aggregate output

The prior discussion focused upon non-farm business sector real output. The choice of concept also affects a measure of real output and productivity for the insurance industry.

TABLE 4
Alternative calculation of premiums and claims for household insurance (billions of chained 1992 dollars)

	BEA Estimate Of Premiums Minus Claims	Alternative Estimate of Premiums Minus claims	Non-farm Business Sector Real Output	Adjusted Non-farm Business Sector Real Output Col. 3 - (Col. 1 - Col. 2)
1987	4.076	3.72	4,259.865	4,259.509
1996	1.603	2.38	5,297.815	5,298.592
Annual growth Rate 1987-96 (compound)	-9.8%	-4.8%	2.452%	2.455%

SOURCE: Column 1 — unpublished data supplied by Bureau of Economic Analysis. Column 3 — unpublished data supplied by Bureau of Labor Statistics, Office of Productivity and Technology.

The effect of including insurance industry investment earnings is to increase non-farm business product by a very small and stable percentage over time.

The effect of moving to an alternative deflation procedure is tentative without an assessment of more price data. However, the likely similarity of results using the current and alternative deflation techniques for auto insurance appears to be supported by the similarity of output and input price indexes for the industry. Even if household insurance growth is currently mismeasured, the relative importance of this expenditure within non-farm business real output is too small to have a significant impact on real output growth.

The current method implicitly deflates claims and premiums with the same deflator. The alternative method would deflate premiums plus investment earnings but not claims.

Further, within a unified measurement framework, the industry's contribution to aggregate real output would be affected. Although these effects will not be discussed in detail here, the implications can be briefly noted.

BEA produces a series labeled Gross Product Originating (GPO) by industry. This series measures the contribution of each industry to GDP. An industry's GPO, often referred to as its 'value added', is equal to gross output minus its intermediate inputs.

Currently, insurance gross output in GPO is measured as premiums minus claims. If Concept 2 were employed, the insurance industry's value added would increase due to the inclusion of investment earnings in gross output.

But its value added would not be affected by the alternative treatment of claims. The claims, rather than being removed in the calculation of gross output, would be subtracted as an intermediate purchase in the derivation of value added.

Part of the additional output due to investment earnings would be subtracted as an intermediate purchase in the derivation of other industries' value added. This would reduce the value added of the other industries' relative to their value added under the current methods of computing GPO. By moving from Concept 1 to Concept 2, the insurance industry's relative contribution to aggregate real output would increase.

8. Uncertainty

Before concluding the paper, the issue of uncertainty needs to be addressed. Some general directions for addressing uncertainty in an output measure are noted; a complete proposal is not included.

In the context of measuring the output of the medical care industry, Martin Feldstein (1969, 145) observed the following about accounting in an output measure for reduction of uncertainty: "There is also a further dimension of output that should not be overlooked: uncertainty. Anything that increases the probability that effective care will be available when requested should be counted as an improvement in the quality of output. As per capita income increases, there will be a greater willingness to pay for reduced uncertainty. Such reductions will be achieved, at least in part, by increases in excess capacity. As a result, costs will rise without a concomitant increase in tangible output. But it would be as wrong to consider this to be a fall in productivity as it would be to measure the productivity of a fire department by the number of fires extinguished per fireman. A failure to allow for the contribution of excess capacity to the reduction of uncertainty will bias downward the measured productivity change."

An analogous issue exists when constructing a measure of output for the insurance industry consistent with Concept 2. As noted in the introduction, the function of insurance is to combine a large number of risks so that the uncertainty surrounding the probability of loss can be reduced.

A company will attempt to spread risk by having a large and geographically diverse group of policyholders. However, it is possible that a company will still face a relatively large uncertainty which could lead to a catastrophic loss.[19]

A catastrophe is a single event causing numerous insured losses or a large single loss exceeding a large specified level set up by the individual insurance company. It represents an unknown concentration of liability subject to one occurrence. Common causes of catastrophes are tornadoes, hurricanes and other violent weather.

If a catastrophe were to strike the policyholders of a particular company, the company might be unable to pay all claims. In the U.S., insolvency guarantee funds exist in each state and are designed to compensate policyholders who suffer loss because of the failure of the insurer. However, in general, each claim is subject to a deductible and there is a cap on the amount that would be paid.

This means that the policyholders will bear a part of the loss themselves in addition to not recovering their losses in a timely manner.

If a company were able to reduce the degree of uncertainty it faces or were more likely to remain solvent so that it could compensate policyholders for catastrophic losses, it can be argued that the company is providing more output or output of higher quality. Two features of the insurance industry are particularly relevant. A company can reduce uncertainty with reinsurance. Further, the equity of the company is available to compensate policyholders in the event of a catastrophic loss.

Normally a company would carry insurance itself for catastrophic events; such insurance is called reinsurance. Reinsurance allows an insurance company to transfer some or all of its risk from one or a group of policies to another company. The reinsurance spreads the risk against the unknown concentration of liability associated with one unfortunate event.

This argument can be extended to the industry level as well. A given level of output, measured according to Q^4, could represent different amounts of outputs depending upon the extent of reinsurance and the reduction of uncertainty for the individual companies within the industry.

If reinsurance arrangements are carried out among domestic companies, then the uncertainty is reduced because a concentration of liability within individual companies is reduced. For example, if two firms with coverage concentrated in two separate geographic areas were to reinsure with each other, there would be a reduction in the uncertainty for each company. Each company's policyholders would be better off.

Further, if reinsurance were purchased from or sold to foreign firms, the domestic industry's output measure would be affected. The foreign reinsurers would allow for the reduction of the uncertainty of the domestic insurers. The domestic reinsurers would reduce the uncertainty to the foreign firms. Both effects imply a quality change to Q^4.

Even with reinsurance and other techniques to spread risk, catastrophic losses still occur. Another source of funds in excess of the nominal amount Q^4 is available to compensate policyholders. The equity of the firm (the excess of assets over liabilities) is also available to pay for policyholder losses. This excess is termed policyholders' surplus. In stock companies it consists of the capital stock. This is made up of the original contributions of the stockholders, amounts paid in excess of the par value of the stock, and any retained earnings. A mutual company has no capital stock and the equity is the policyholders' surplus.

The following (see A.M. Best Company 1994) summarizes the importance of policyholders' surplus: "Surplus represents additional security for policyholders and is an important safety cushion for protection against catastrophes and other unexpected underwriting events and onerous regulatory actions" (p. xi). "Surplus represents a safety cushion to protect against the unexpected and is a key

denominator of many financial ratios measuring the financial strength of an insurance company" (p. xi). Because of the policyholders' surplus, the industry is better able to protect policyholders from the effects of uncertainty than it could if its only sources of funds to pay claims and administrative costs were premiums and investment earnings.

There are two general approaches for addressing a reduction of uncertainty or increased protection against it. One would be to adjust an output deflator for quality change; the other is to add an amount to the nominal value of output to reflect increased risk protection.

If real output is measured by deflating Q^4, then an attempt could be made to adjust an output deflator for the quality change. For example, A.M. Best Company rates insurance companies based in part on the quantity and quality of their surplus as well as the quality and appropriateness of their reinsurance program. If the A.M. Best Company rating for a company changes, the price collected for that company could be adjusted. The BLS plans to evaluate such a procedure as it collects prices for its new PPI insurance price index.

If the extrapolation procedure were employed to estimate real output, then another type of adjustment would be required. It would be necessary to add some amount to the industry's nominal value of output to represent the extra protection provided by the surplus and reinsurance. That is, some amount would be added to Q^4 to reflect additional protection against uncertainty.

9. Concluding comments

The measure of property and casualty insurance output should be based upon Concept 2, the assumption of risk. This is consistent with the actual transaction that takes place between the industry and a policyholder. It reflects what the policyholder expects to receive and what the industry expects to provide.

The nominal value should include investment earnings on premiums as in Q^4. Including the investment earnings in a measure of output is necessary to reflect accurately the amount of risk the industry is able to assume and the administrative costs that it incurs while assuming the risk. The industry has suffered underwriting losses in the past because premiums alone were not adequate to cover claims and administrative costs.

Some adjustment should be made to output if there are significant changes associated with the way the industry is able to protect policyholders from catastrophes. The industry uses reinsurance to reduce the uncertainty surrounding the estimate of the probability of an unfortunate event and policyholder surplus is available as a further protection in the event of a catastrophe.

Lastly, a choice needs to be made between the two methods of converting the nominal value of output into real terms – using a price index (like the new PPI price index) as a deflator or extrapolating base period nominal value of output with the amount of real risk assumed. Both methods account for the tradeoff

between investment earnings and premiums.

The accuracy of a price index is dependent upon adjustments for changes in the probability of loss and the inflation in the prices of replacement assets and repair services. Further, because the PPI is a new series, it will not be possible to construct an historical output series for some time. One advantage of the deflation method is that it may be easier to adjust the price index for changes in catastrophic protection.

The extrapolation procedure takes account of changes in the probability of loss and inflation in replacement assets and repairs in a relatively straightforward manner. However, it may be difficult to adjust the measure for changes in catastrophic protection. It is recommended that, to the extent possible, both procedures be implemented so that the reasonableness of each may be assessed.

The choice of concept for measuring property and casualty insurance output is likely to impact considerably more on industry level productivity measures than upon an aggregate productivity measure such as the BLS non-farm business sector productivity measure. Further, it is likely to be quite difficult to make the adjustments to an aggregate measure necessary to implement Concept 2. For example, all the expenditures on auto repairs would have to be divided into those paid for with insurance claims and those paid for in other ways.

Although no assessment has been made here of health and life insurance, any such assessment should include an examination of the alternative concepts and measurement techniques discussed in this paper. Even within an aggregate framework these are important components. In 1996, premiums less claims were $56.3 billion for health insurance and $79.9 billions for life insurance.[20] The addition of investment earnings on premiums is likely large and an alternative deflation procedure may be consequential for these two types of insurance.

Appendix A

Premiums and investment earnings data

	Net Premiums Earned:			Inventory Gain on Funds and Other Income:		
	Private Passenger Auto Liability (1,000)	Private Passenger Physical Damage[a] (1,000)	Homeowner Multiple Peril[a] (1,000)	Private Pass Auto Liability[a]	Private Pass Auto Physical Damage[b]	Homeowner Multiple Peril[b]
1987	36,165,438	25,999,155	16,053,407	9.4	2.4	4.8
1988	39,845,488	28,207,012	16,829,872	9.7	2.4	4.8
1989	43,073,918	29,397,413	17,349,748	10.1	2.5	5.1
1990	46,912,975	30,343,553	18,116,422	10.2	2.4	5.2
1991	50,040,309	31,225,683	18,885,396	10.3	2.4	5.4
1992	54,081,266	32,454,880	19,741,042	10.4	1.7	6.5
1993	57,861,722	33,630,173	20,791,374	9.4	1.7	6.2
1994	60,832,460	34,205,291	21,787,545	8.3	1.7	4.8
1995	64,338,111	35,960,806	23,162,557	9.1	1.8	5.3
1996	67,145,686	38,757,778	24,665,365	8.7	1.6	4.9

[a] Net premiums are direct premiums plus reinsurance assumed less reinsurance ceded. This is not the same as the national accounts notion in which net premiums equal premiums less claims.

[b] Ratios to premiums earned. Ratios do not include investment gain attributed to capital and surplus.

SOURCE: A.M. Best Company (1997, 218-220); reproduced with permission.

Appendix B

Further issues of implementation

Let us assume that Q^4 is chosen as the nominal value of output measure and that the extrapolation procedure is employed to convert it into real terms. Many practical issues must be addressed. Among these issues, the industry pays claims for other occurrences besides the replacement of a capital good and changes in customer services need to be incorporated.

A.1 Claims for other than loss of a capital good: The H&P model is limited to the replacement of physical assets. Their model can be generalized to account for: damage to, rather than loss, of an asset; liability for negligent damages to a third party's goods and for injuries or death to a third person that result in medical costs and possible loss of income; and medical costs for the insured. These extensions can be categorized as: a.) claims paid to someone other than the insured; b.) claims for occurrences other than the loss of capital goods; and c.) claims paid for purchases in subsequent time periods.

A.1.a Claims paid to someone other than the insured: When measuring the industry's output, there is no need to differentiate among recipients of claims. The

amount of assumed risk is relevant to individual policyholders. But the fact that claims are paid to someone other than the policyholder in the case of liability is not relevant to the output of the industry.

The complication is that the analog of the insurance industry buying a replacement good and passing it through to the claimant, who in the simple model is also the insured, must be extended. Liability is that which one person owes another person. If the liable person has no insurance, he or she would have to pay out of his or her own pocket. It is possible to visualize that the insurance industry pays the claim to the insured who passes it to the third party to satisfy the liability obligation. Only one transaction occurs as far as the industry is concerned and this transaction is with the insured.

A.1.b Claims for occurrences other than the loss of capital goods: Some straightforward expansion of H&P is required here. Recall that in the H&P framework an insurance industry transacts with the replacement capital goods producing industry as well as with consumers who buy policies and receive claims.

Repair of damages to goods can be viewed as the insurance industry buying repair services for the claimant. For injuries, it is possible to view the medical services as being purchased for the injured by the insurance industry. Just as a replacement capital good is an intermediate purchase, the repair services and medical services are also intermediate purchases for the insurance industry.

The extension for death or injury and resulting compensation for lost purchasing power is more difficult to make. The payment is made in the form of a bundle of goods representing the lost purchasing power that the claims are supposed to replace. In this case there is no way to identify the industry from which the goods are purchased other than to note there is a bundle of goods purchased by the insurance industry and passed through to the insured.

A.1.c Claims for purchases in subsequent time periods: As a further complication, it is possible the claim payment will be spent over a period of time longer than the current period. For example, to replace the lost purchasing power due to injury or death a claim may be spent over several time periods.

Loss of purchasing power can be evaluated either as a discounted stream of future purchases or directly as a cash payment to the claimant. The discounted value of future purchases cannot exceed the current value of the claims or the value of the goods that could be purchased in the current period with the settlement.

It is still necessary to interpret these as intermediate purchases for the industry. An interpretation can be based upon a concept of temporal imports and exports used by Domar to describe inventories. According to his formulation, the inventories at the beginning of the period are from the prior period's output and represent a temporal import into the current period. The inventories at the end of the period represent a temporal export.[21] Domar's concept of temporal imports and exports can be applied by viewing the discounted stream of goods that will be purchased in future periods to be temporal imports by the insurance industry into the current time period when the claim is actually paid.

A.2 Customer services: Even though assuming risk is the service provided by the industry, there are certain functions which influence the quality of the basic service. These are primarily related to interactions with customers. Changes in these

interactions represent a change in quality which is a change in output. Examples are providing representatives on a 24 hour basis or setting up more convenient damage assessment procedures.

These services are analogous to the banking industry setting up branch banks in order to more conveniently provide its basic services which are to transform liabilities (deposits) into assets (loans) and to facilitate the economy's payment system. Employing the terminology of Fixler and Zieschang (1992, 254-256), let us refer to these quality characteristics as indicators of the 'convenience-of-service.'

The implicit assumption underlying the extrapolation procedure for measuring real output is that there are no quality changes associated with indicators of convenience-of-service. Convenience-of-service per unit of output is constant. Referring to the auto assembly analogy, the analog of this assumption is that the quality of an automobile is constant through time with respect to the assembly plant. Thus, measuring growth by counting steering wheels would miss any quality change to automobiles, such as increased reliability, imparted by more careful assembly procedures.

There are two ways to address this. First, it can be determined whether the nominal costs of producing these higher quality services is relatively small with respect to the amount of risk assumed for the industry. If the costs are relatively small, the changes in services have relatively little impact on output.

Or, an attempt could be made to estimate the value of the quality change. For example, Fixler and Zieschang focus on the impact of branch banking on output by examining the relationship between the average deposit service charge rate and the number of branch offices. The service charge rate is regressed against six branch bank variables.

Without proposing a specific method for insurance, nominal administrative costs associated with customer contacts (e.g., the claims department) could be divided by real output. The resulting costs per unit of real output would yield an implicit service charge rate for the services or the price of services per unit of output. This price for various companies could be regressed against variables such as the number of hours representatives are available or time required to file a claim. The result would allow for an adjustment to real administrative costs, which are assumed to change at the same rate as the amount of risk assumed.

Notes

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This paper presents the views of the author alone and does not represent Bureau of Labor Statistics policy or the views of other BLS staff members.

1 An example of this discussion may be seen in the report of the VOORBURG GROUP (1993, 181-239). This report includes papers by Walton (1993) and Collins (1993).
2 In the GDP portion of the U.S. national accounts, net premiums paid by the households are included in personal consumption expenditures (PCE). The claims are reflected in PCE in purchases by households from other industries such as the auto repair industry.
3 Collins notes "Insurers state that they charge lower premiums because they receive investment income. This suggests a barter arrangement and that investment income should be included in revenue from production." Collins (1993, 216).
4 H&P acknowledge that they are neglecting interest earned by the insurance company on premiums paid. Denny does as well. Hornstein and Prescott (April 1991 198), Denny (1980, 150).
5 Even if the input prices do not change, it is possible that because of changing technology, the relationship between the inputs and the amount of output produced with the inputs changes. A resulting change in the value of insurance output would also represent a change in price.
6 Hornstein and Prescott (April 1991).
7 Also, see Ruggles (1983, 67-72) for a discussion of the impact on GDP of employing a premiums, rather than premiums minus claims, measure.
8 U.S. Department of Commerce (1988, 102).
9 U.S. Department of Commerce (July 1997, 82).
10 Housing expenditures for owner occupied dwellings are measured on a rental equivalency basis in PCE. The insurance on the dwelling is assumed to be paid by the landlord and included in the rent. There is no explicit expenditure on homeowner multiple peril insurance within PCE. The CPI measures changes in homeowner costs on a rental equivalency basis as well; there is no CPI for homeowner insurance.
11 Net premiums earned (in thousands) in 1996 were: $24,665,365 for homeowners multiple peril; $67,145,686 for private passenger auto liability; $38,757,778 for private passenger auto physical damage; and $263,192,128 for All Lines Total. Source: A.M. Best Company (1997, 218-222); reproduced with permission.
12 This result is not necessarily true for net exports where offsetting adjustments are ambiguous. Data on property and casualty insurance in net exports are not available to assess the impact of moving to an alternative procedure.
13 The data do not include investment gain attributed to capital and surplus. The importance of surplus will be discussed in the next major section of this paper, which addresses uncertainty.
14 A CPI for insurance is based upon the notion of measuring the change over time in the premium for a policy with a fixed set of characteristics. (The characteristics of policies can differ among the companies from which premiums are collected and quotes can be gathered for more than one specific policy in a given company. But premiums are collected over time for each specific policy.)

To illustrate for auto insurance, major specifications for a policy for which a premium will be collected include: the policy type (e.g. liability and physical damage); the amounts of coverage; the geographic location where the car is principally garaged; the uses of the car (e.g., includes commuting); and characteristics of the car (make, model and age); and characteristics of the driver. This specification of the policy is held constant over time when premiums are collected.

15 The CPI for tenants' insurance is based upon the same notion as the CPI for autos. For example, the specification of the policy includes whether or not liability coverage is

included: what types of perils are covered, etc.

The amount of coverage specified for the policy is adjusted over time to reflect the need for increased coverage due to inflation in the costs of replacement items. Any resulting changes in premiums are considered to be price changes.

16 See Masterson (1968) for the methods used to derive the claims cost indexes. Interestingly, the conceptual foundation that Masterson presents for the indexes he developed is the notion that insurance companies are purchasers of the goods and services used to settle claims.

William R. Van Ark, a consulting actuary with Watson Wyatt Worldwide in Southfield, Michigan, has taken over the updating of the indexes for the past few years. The indexes are published by A.M. Best Company and are reproduced here with permission.

17 The different growth rates between 1982-84 and 1987 certainly need to be investigated further.

18 The claims cost index includes costs associated with the dwelling and includes liability coverage; the tenants' insurance excludes insurance on the dwelling, and policies that are priced need not include liability coverage.

19 See, for instance, Allstate (1985, 238-9) and Vaughan and Vaughan (1996, 150) for a discussion of catastrophic losses.

20 U. S. Department of Commerce (August 1997, 57).

21 Domar (1961, 723).

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